NEURODYN 10 channels

Instruction Manual

Apparatus for Stimulation Therapy Transcutaneous Electrical Nerve

(ANVISA registration No. 10360310023)

9ª edition

(07/2012)

ATTENTION:

THIS MANUAL OF INSTRUCTION REFERS TO NEURODYN 10 channels EQUIPMENT MANUFACTURED BY IBRAMED.

PLEASE READ THIS MANUAL CAREFULLY BEFORE USING THE EQUIPMENT AND ALWAYS REFER TO IT WHENEVER DIFFICULTIES APPEAR. KEEP THIS MANUAL ALWAYS AT HAND.

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IBRAMED

ATTENTION
RISK OF ELECTRICAL SHOCK
DO NOT OPEN

The lightning bolt symbol inside a triangle is a warning about the presence of "dangerous voltage", without insulation in the internal part of the equipment which may be strong enough to cause risk of electrical shock.

An exclamation mark inside a triangle alerts the user about the existence of important operation and maintenance instructions (technical service) for this equipment.

ATTENTION: To prevent electrical shock do not use the equipment plug attached to an extension cable or to any other type of plug except that the terminals fit perfectly in the receptacle. Disconnect the input plug from socket when not using the equipment for a long period of time.

General care for the equipment

NEURODYN 10 channels is equipment that does not require special safety measures in its installation. We suggest that you:

- Avoid places subject to vibrations.
- Install the equipment on a firm and horizontal surface, in a site with perfect ventilation.
- In case of a built-in cupboard, make sure that there is no obstacle for the free air circulation on the back of the equipment.
- Do not lay it on carpets, rugs, cushions or other soft surfaces that can obstruct the ventilation.
- Avoid humid, hot and dusty places.
- Place the cable in order to leave it free, out of places where it can be trodden on, and do not place any furniture over it.
- Do not insert objects into equipment orifices and do not place recipients with liquid on it.
- Do not use volatile substances (benzene, alcohol, thinner and solvents in general) to wipe the equipment cabinet because they can damage the finishing. Use only a soft, dry, and clean piece of cloth.

Explanation of the used symbols

- **ATTENTION!** Check and follow the instructions in this manual.

- Equipment CLASS II. The protection against electric shock is not based only in the basic insulation but also incorporates additional safety precautions, such as double or reinforced insulation, not holding grounding resources protection or depending on installation conditions.

- Equipment with BF type applied part.

- Risk of electrical shock.

IPX0 - Equipment not protected against harmful water dripping.

- Indicates electrostatic discharge sensibility

- Start treatment.

- Stop treatment.

- Off switch.

- On swith.

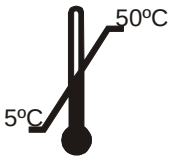
V~ - Volts in Alternate Current

~ line - Alternate current power line

Carton:

-FRAGILE: The content in this package is fragile and should be handled with care.

-THIS SIDE UP: Indicates the correct position to ship the package.



- TEMPERATURE LIMITS: Indicates the limit temperatures for transportation and storage the package.

KEEP IT AWAY FROM THE RAIN: This package should not be shipped under rain.

- MAXIMUM STACKING NUMBER: The maximum number of identical packages which can be stacked. For this equipment, the limit stacking number is 5 units.

Preliminary Observations:

The **NEURODYN 10 channels** is equipment with the following types of current RUSSIAN (2.500Hz modulated by low frequency in the 1 to 120Hz range), AUSSIE (4,000Hz or 1.000Hz modulated bt kiw frequency in the 1 to 120Hz range) and ELETROLIPOLISE (2.500Hz modulated by 5Hz low frequency). These techniques are noninvasive, without systemic effects. They do not cause dependency and have no undesirable side effects and can be used in all trauma-orthopedics and derma-functional treatments (esthetic). The equipment corresponds to safety and protection **CLASS II** type **BF.** It must be operated only by qualified professionals and in properly authorized medical departments. The use of these units is not intended for rooms with risk of explosion such as anesthesia departments or the presence of an anesthetic flammable mixture with air; oxygen or nitric oxide.

POTENTIAL ELECTROMAGNETIC INTERFERENCE: As for the limits regarding electromagnetic disturbance, NEURODYN 10 channels is electro-medical equipment that belongs to Group 1, Class A. The simultaneous connection of the patient to the NEURODYN 10 channels and to surgical equipment of high frequency can cause burns in the application area of the electrodes and it may damage the stimulator. The operation at a short distance (1 meter, for example) of a short wave or microwave therapy equipment can produce instability in the output of the equipment. In order to prevent electromagnetic interference, we suggest that one group of power supply line is used for NEURODYN 10 channels and another separate group for the short wave and microwave equipment. We also suggest that the patient, o NEURODYN 10 channels and the connection cables are placed at least at a distance of 3 meters away from the shortwave or microwave therapy equipment
Radio frequency communication equipment, mobile or portable, may cause interference and affect the functioning of o NEURODYN 10 channels.

Attention: The application of the electrodes close to the thorax may increase the risk of cardiac fibrillation.

NEURODYN 10 channels description:

The NEURODYN 10 channels uses microcomputer technology, this means it is **microcontroller**. It was designed following the existing technical manufacturing standards for medical equipment (NBR IEC 60601-1 NBR IEC 60601-1-2 and NBR IEC 60601-2-10).
NEURODYN 10 channels is a complete single operation unit with 10 output channels, enabling several treatment options, and is essential to the clinical practice. It is an equipment designed to production of medium frequency current, Russian current and Aussie current for treatment of neurologic, orthopedic, traumatologic and esthetic impairment (Electrolipolysis, Lymphatic Drainage, etc).
Essential Performance: Neurodyn 10 channels is equipment for the application of electrical current via electrodes in contact with the patient. It is a transcutaneous muscular stimulator. NEURODYN 10 channels was developed taking into consideration the need of the professional that works in different areas of physical rehabilitation, esthetic medicine and esthetic. It is an electro-stimulator with 10 output channels for the patient, with independent intensity controls, this means, each channel has an individual intensity control that can be used in the on-going, synchronous, alternate, clearing and sequential manner. Neurodyn 10 channels generates Russian current in the 2,500 Hz frequency, Aussie current (also called Australian current) in **4.000Hz frequency** or 1.000Hz modulated in **Bursts** with duration of **4 ms** or 2ms, lymphatic drainage with possibility of choice of 4 to 10 channels in sequential mode and electrolipolysis for localized fat treatment Stimulation current application is performed through transcutaneous electrodes (Russian and Aussie Currents) or needles (electrolipolysis).
The therapy technique with Russian or Aussie current consists in application of a smooth electrical stimulation by means of electrodes placed on areas of the body. The Electrolipolysis technique consists in application of smooth stimulation though needle type electrodes. The technique with Russian or Aussie current is not invasive and the Electropolysis technique is invasive. Both do not present systemic effects, they do not cause dependency and they have no undesirable collateral effects. The intensity of the current required for the treatment depends on patient's feeling. Thus, the treatment should start with minimum intensity levels (very low), increasing the level carefully until achieving the effects adequate for the procedure and according to the patient's reaction. When a person is subject to different types of current, they will feel a pricking sensation on the place or areas between the electrodes.
Generally this feeling is comfortable to most of the persons. The degree of feeling is controlled by the adjustment of the equipment parameters (controls). Due to the fact that the utilized technology is the same microcomputer technology, these controls operate using the touch screen. All the information regarding the parameters chosen by the professional therapist will be shown in the alphanumeric liquid crystal screen.

The NEURODYN 10 channels enables the following stimulation modes:

RUSSIAN Current (2.500Hz):

- CONTINUOS MODE

- SYNCHRONIZED MODE (with gradients: On, Off, Rise and Decay)

- ALTERNATE MODE (with gradients: On, Off, Rise and Decay)

- SEQUENTIAL MODE (with selection option from 4 to 10 channels)

- CLEARING MODE

AUSSIE current (AUSTRALIAN current) (carrying frequency of 1.000Hz or 4.000Hz with burst duration of 4ms or 2ms):

- CONTINUOUS MODE

- SYNCHRONIZED MODE (with gradients: On, Off, Rise and Decay)

- ALTERNATE MODE (with gradients: On, Off, Rise and Decay)

- SEQUENTIAL MODE (with selection option from 4 to 10 channels)

- CLEARING MODE

ELECTROLIPOLISE (2.500Hz modulated by 5Hz):

- CONTINUOUS MODE

The equipment allows for the selection of the following parameters:

CHANNEL 1 – regulates the intensity of channel 1

CHANNEL 2 – regulates the intensity of channel 2

CHANNEL 3 – regulates the intensity of channel 3

CHANNEL 4 – regulates the intensity of channel 4

CHANNEL 5 – regulates the intensity of channel 5

CHANNEL 6 – regulates the intensity of channel 6

CHANNEL 7 – regulates the intensity of channel 7

CHANNEL 8 – regulates the intensity of channel 8

CHANNEL 9 – regulates the intensity of channel 9

CHANNEL 10 – regulates the intensity of channel 10

TIMER – Allows for the selection of an application time of 1 to 60 minutes. At the end of the selected time, a sound will be heard the passing of current to the patient will stop. The selected value will decrease at the same time in which such time is elapsed.

Type of current:

RUSSIAN – Mode: CONT (continuous)

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 2500 Hz, modulated by a low frequency of the range chosen by the therapist, from 1 Hz to 120 Hz. The stimulation sensation is continuous and constant.

RUSSIAN – **Mode: SYNC or REC. (synchronized or alternate)**

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 2500 Hz, modulated by a low frequency of the range chosen by the therapist,

from 1 Hz to 120 Hz. The stimulation sensation follows the times chosen in the On, Off, Rise and Decay gradients.

RISE (pulse increase gradient) – pulse increase time, variable from 1 to 20 seconds. Regulates the contraction speed, this means the time from the start through the maximum muscular contraction. Long times produce a slow, more gradual contraction. Low times produce a more sudden contraction (rise).

DECAY (pulse decrease gradient) – pulse decrease time, variable from 1 to 20 seconds. Regulates the speed through which the contraction is reduced, this means the time from maximum contraction through muscular relaxation. High times produce um slow relaxation. Low times produce a sudden relaxation.

ON TIME (connection time) – maximum muscle contraction time, variable from 1 to 60 seconds. Regulates the time that the current circulates through the electrodes during each stimulation cycle.

OFF TIME (disconnection time) – rest muscle contraction time, variable from 1 to 60 seconds. Regulates the time that the current does not circulate through the electrodes during each cycle.

Note:

When the RUSSIAN CONTINUOUS is selected, the Rise, On, Decay and Off parameters are deactivated. Consequently, there will be a continuous, constant sensation.

Once the RUSSIAN SINCRONIZADO is selected, channels 1 to 10 work together at the same time, this means, the channels simultaneously execute the selected Rise, ON, Decay and Off times.

When the ALTERNATE RUSSIAN is selected, the channels **1, 2, 3, 4** and **5** work alternately with channels **6, 7, 8, 9** and **10.**

RUSSIAN – Mode: SEQ. (sequential)

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 2.500 Hz, modulated by a low frequency of the range chosen by the therapist, from 1 Hz to 120 Hz. The stimulation sensation continues at the selected time on the Rise gradient.

RISE (pulse increase gradient) – pulse increase time, variable from 1 to 20 seconds. It regulates the sequence velocity of the channels.

Note: In the SEQ. mode, the sensation is transmitted from one channel to another in a sequential manner, the first channel only stops the passage of the stimulation when the third is transmitting the same stimulation frequency. Thus, there is no chance of a liquid reflux. The equipment allows for a sequential selection from 4 to 10 channels.

RUSSIAN – **Mode: DES (clearing)**

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 2.500 Hz, modulated by a low frequency of the range chosen by the therapist, from 1 Hz to 120 Hz. The stimulation sensation continues at the selected time on the Rise gradient.

RISE (pulse increase gradient) – pulse increase time, variable from 1 to 20 seconds. It regulates the sequence velocity of the channels.

Note: In the DES mode the sensation is transmitted from a channel to another in an increasing sequential manner, and then, immediately in a decreasing sequential manner. The equipment allows for a clearing selection from 4 to 10 channels.

Aussie current (Australian current) - Mode: CONT (continuous)

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 1.000 Hz, or 4.000 Hz (chosen by the therapist) modulated by a low frequency of the range (chosen by the therapist), from 1 Hz to 120 Hz. Selection of Burst in 4ms or 2 ms is possible.
The stimulation sensation is continuous and constant.

Aussie current (Australian current) - Mode: SYNC or REC. (synchronized or alternate)

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 1.000 Hz, or 4.000 Hz (chosen by the therapist) modulated by a low frequency of the range (chosen by the therapist), from 1 Hz to 120 Hz. Selection of Burst in 4ms or 2 ms is possible.
The stimulation sensation follows the times chosen in the On, Off, Rise and Decay gradients.

RISE (pulse increase gradient) – pulse increase time, variable from 1 to 20 seconds. Regulates the contraction speed, this means the time from the start through the maximum muscular contraction. Long times produce a slow, more gradual contraction. Low times produce a more sudden contraction (rise).

DECAY (pulse decrease gradient) – pulse decrease time, variable from 1 to 20 seconds. Regulates the speed through which the contraction is reduced, this means the time from maximum contraction through muscular relaxation. High times produce um slow relaxation. Low times produce a sudden relaxation.

ON TIME (connection time) – maximum muscle contraction time, variable from 1 to 60 seconds. Regulates the time that the current circulates through the electrodes during each stimulation cycle.

OFF TIME (disconnection time) – rest muscle contraction time, variable from 1 to 60 seconds. Regulates the time that the current does not circulate through the electrodes during each cycle.

Note:

When the RUSSIAN CONTINUOUS CURRENT is selected, the Rise, On, Decay and Off parameters are deactivated. Consequently, there will be a continuous, constant sensation.

Once the AUSSIE SYNCHRONIZED CURRENT is selected, channels 1 to 10 work together at the same time, this means, the channels simultaneously execute the selected Rise, ON, Decay and Off times.

When the ALTERNATE AUSSIE CURRENT is selected, the channels **1, 2, 3, 4** and **5** work alternately with channels **6, 7, 8, 9** and **10.**

Aussie current (Australian current) - Mode: SEQ. (sequential)

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 1.000 Hz, or 4.000 Hz (chosen by the therapist) modulated by a low frequency of the range (chosen by the therapist), from 1 Hz to 120 Hz. Selection of Burst in 4ms or 2 ms is possible.

The stimulation sensation continues at the selected time on the Rise gradient.

RISE (pulse increase gradient) – pulse increase time, variable from 1 to 20 seconds. It regulates the sequence velocity of the channels.

Note: In the SEQ. mode, the sensation is transmitted from one channel to another in a sequential manner, the first channel only stops the passage of the stimulation when the third is transmitting the same stimulation frequency. Thus, there is no chance of a liquid reflux. The equipment allows for a sequential selection from 4 to 10 channels.

Aussie current (Australian current) - Mode: DES (clearing)

FREQ (Hz) – (frequency in Hertz): in this case the equipment will operate at an average frequency of 1.000 Hz, or 4.000 Hz (chosen by the therapist) modulated by a low frequency of the range (chosen by the therapist), from 1 Hz to 120 Hz. Selection of Burst in 4ms or 2 ms is possible.
The stimulation sensation continues at the selected time on the Rise gradient.

RISE (pulse increase gradient) – pulse increase time, variable from 1 to 20 seconds. It regulates the sequence velocity of the channels.

Note: In the DES mode the sensation is transmitted from a channel to another in an increasing sequential manner, and then, immediately in a decreasing sequential manner. The equipment allows for a clearing selection from 4 to 10 channels.

ELECTROLIPOLISE - Mode: only CONT (continuous)

FREQ (Hz) – (frequency in Hertz): in this case the equipment operates in average frequency of 2,500 Hz modulated by a 5 Hz low frequency. The stimulation sensation is continuous and constant.

NEURODYN 10 channels – ELECTRICAL AC INPUT

Neurodyn 10 channels is a CLASS II monophasic equipment with BF applied part for safety and protection. Neurodyn 10 channels operate in network voltages in the range of 100 - 240 volts 50/60 Hz. Just plug in the equipment to the “power outlet” and the equipment will perform, automatically, the selection of the network voltage.

The connection cable to the electric line is detachable.

The equipment uses the line plug as a resource to separate electrically the circuits of the power line in all the poles.

ATTENTION:

On the rear part of the NEURODYN 10 channels, is located the protection fuse. To replace them, turn the equipment off, unplug it from the power outlet and, with a small screwdriver, take the protective lid off, disconnect the fuse, perform the replacement and put the lid back to its original place.

Always use fuses recommended by IBRAMED:

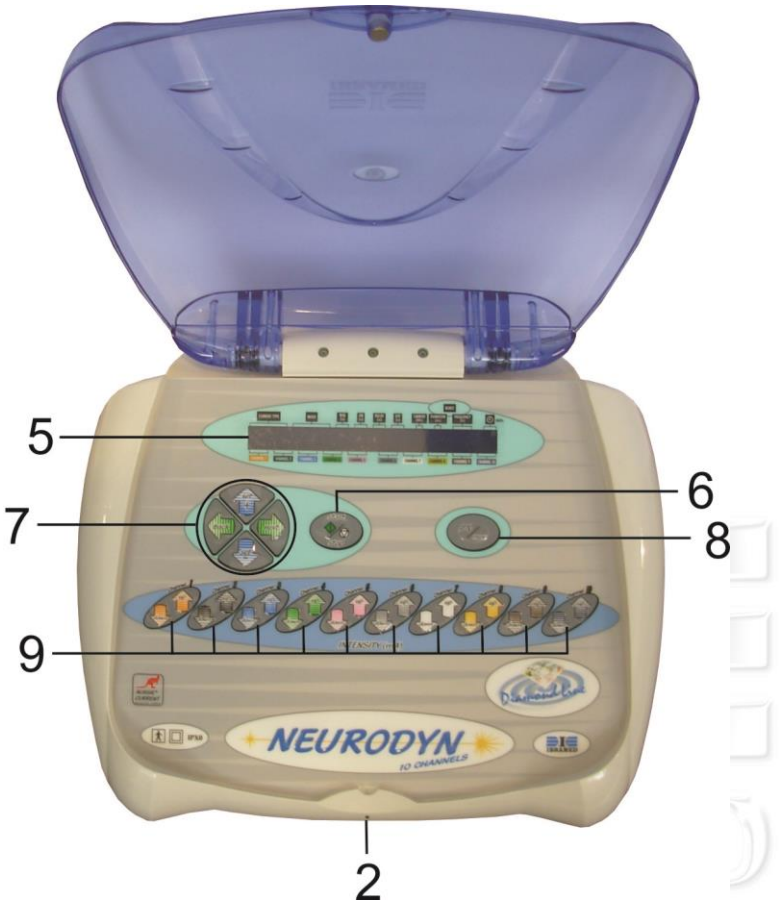
Use fuse of 5A (20 AG)

SECURITY RISKS MIGHT OCCUR IF THE EQUIPMENT IS NOT PROPERLY INSTALLED.

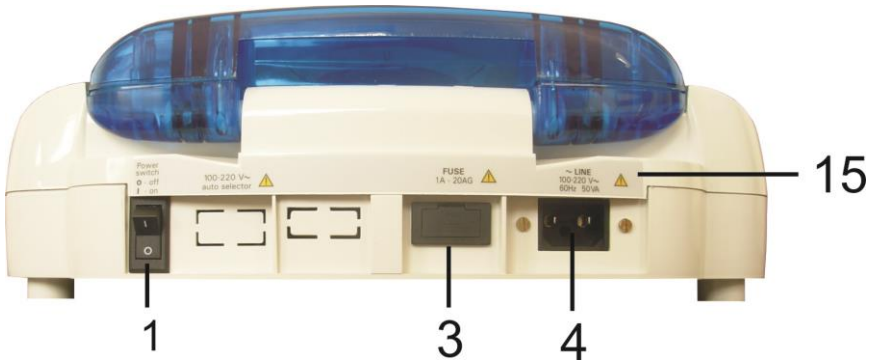
NOTE: There are dangerous voltages inside the equipment. Never open the equipment.

NEURODYN 10 channels - Controls, indicators and operating instructions.

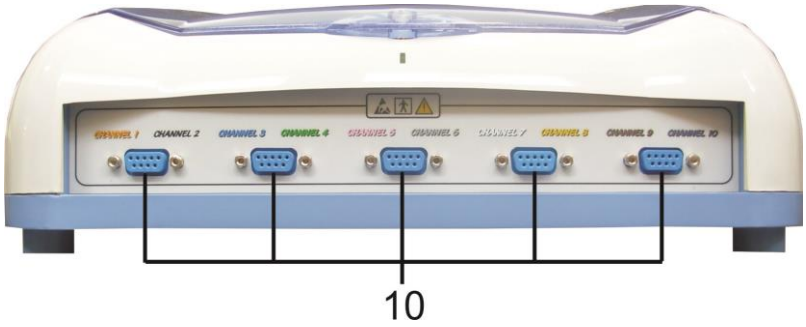
TOP VIEW



REAR VIEW



FRONT VIEW



BOTTOM VIEW

1- On-OFF key.

2- Light Indicator (green) of ON condition.

3- Fuse rack.

4- Power cable port to be connected to the power supply line.

5- Alphanumerical liquid crystal **DISPLAY**

6- START/STOP control keys

7- BACK/NEXT keys. **SET+** and **SET -** control keys.

8- Control key **PROGRAM/MENU**

9- Current intensity control keys of **CHANNEL 1** to **CHANNEL 10.** Each channel has a luminous yellow indicator. This luminous indicator (yellow) indicates the presence of an output area that can deliver a tension higher than 10 Volts or a current higher than 10 mA to a charge resistance of 1000 ohms. After programming the equipment and pressing the START key, as long as the equipment is connected in CONT. (continuous) stimulation mode, this indicator will remain continuously on. When the stimulation mode for SYNC. or ALT. (synchronized or alternate), this indicator "will flicker" in accordance with the On Time, OFF Time, Rise and Decay times We suggest to always increase the intensity during the On Time (on) cycle.

10- Cable connection to the patient (channels 1 to 10).

11- ATTENTION plate. Do not open this equipment. Risk of electrical shock.

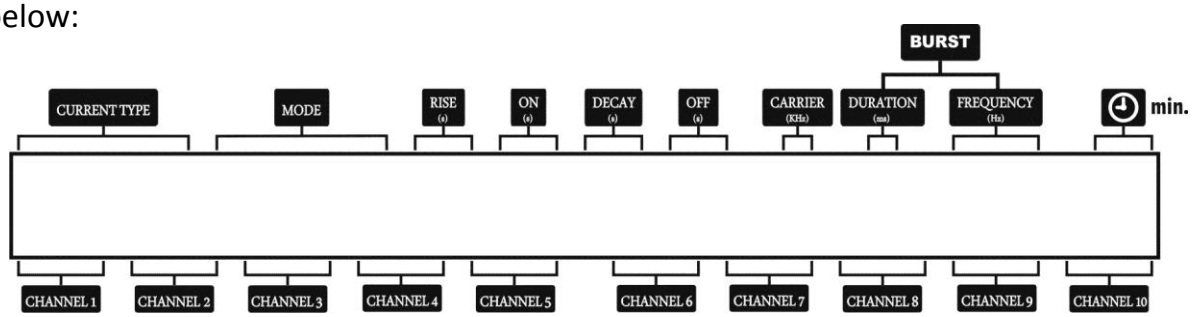
12- Quality control seals.

13- General characteristics pane**.**

14- Air entrance.

15- Board power and voltage.

All the parameters are programmed by touch keyboard and indicated on the liquid crystal display. Thus, the description and the necessary steps to operate this equipment are shown below:



CURRENT TYPE — Field designed for the selection of the **TYPE of CURRENT:** (Russian - current Russian, Aussie – current Aussie or Electrolipolysis).

MODE — Field designed for the selection of the **MODE** of stimulation**: Cont.** - Continuous, Sync. - Synchronized; Alt. - Alternate; Seq. - Sequential of 4, 5, 6, 7, 8, 9 or 10 channels; Des. - Clearing of 4, 5, 6, 7, 8, 9 or 10 channels.

RISE (s) — Field designed for the selection of the **PULSE RISE TIME** (time to go from rest to maximum contraction – pulse increase gradient), variable from 1 to 20 seconds.

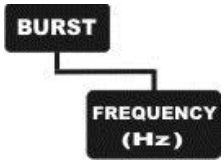
ON (s) — Field designed for the selection of the **CONNECTION TIME** (time of sustentation of the maximum muscle contraction), variable from 1 to 60 seconds.

DECAY (s) — Field designed for the selection of the **PULSE DESCENT TIME** (time to go from maximum contraction to rest – pulse decrease gradient), variable from 1 to 20 seconds.

OFF (s) — Field designed for the selection of the **REST TIME** of the muscle contraction, variable from 1 to 60 seconds.

CARRIER (KHz) — Field designed for selection of **CARRYING FREQUENCY** of the Aussie current (1KHz or 4KHz).

BURST / DURATION (ms) — When the type of selected current is **Aussie** this field is designed for selection of the **BURST DURATION** parameter (Burst width): **2ms** or **4ms**.

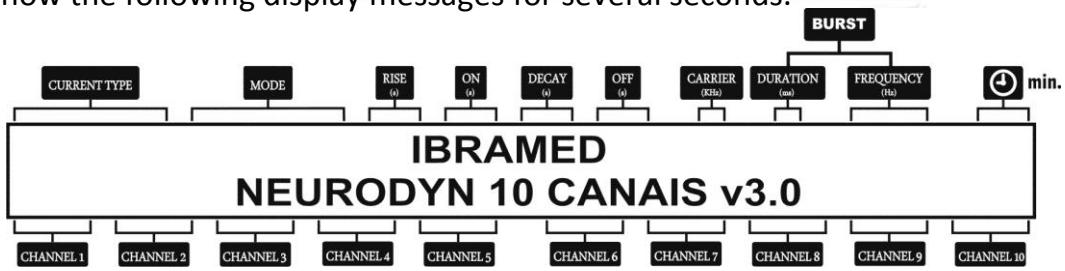


When the type of selected current is **Russian** or **Aussie** this field is designed for selection of the **BURST DURATION** parameter (Burst repetition frequency): variable from **1Hz to 120 Hz.**

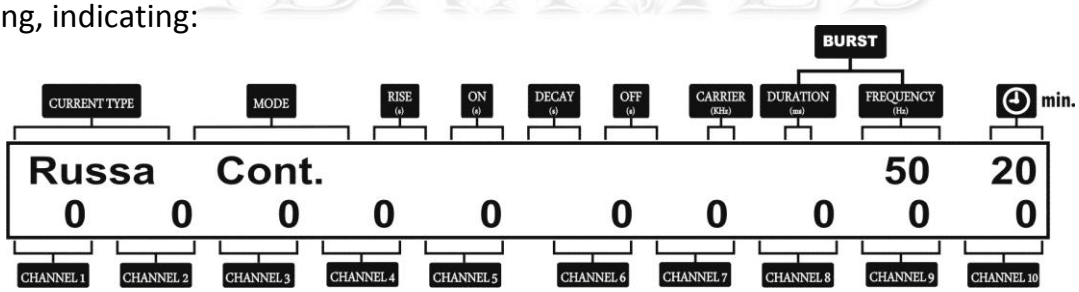
Field designed for the selection of the **APPLICATION TIME** (TIMER). Allows for the selection of an application time of 1 to 60 minutes.

Learning how to use Neurodyn 10 channels:

1º step: Turn on – turn off key (1). When connecting the equipment, the liquid crystal screen (5) will show the following display messages for several seconds.



After this presentation, a sound signal ("beep") will be heard and the screen (5) will start operating, indicating:



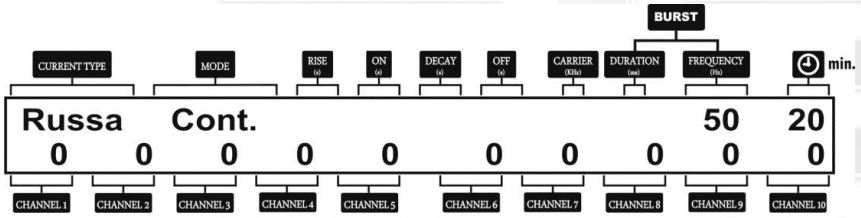
Note cursor flickering above letter R of the word **Russian**.

2º step: BACK and NEXT (7) control keys: These keys are used to select the necessary treatment parameters. When pressing the NEXT key you will be taken to the next parameter. When pressing the BACK key you will be go back to the previous parameter. Note that after each selection performed through the BACK and NEXT keys the chosen parameter will remain flickering.

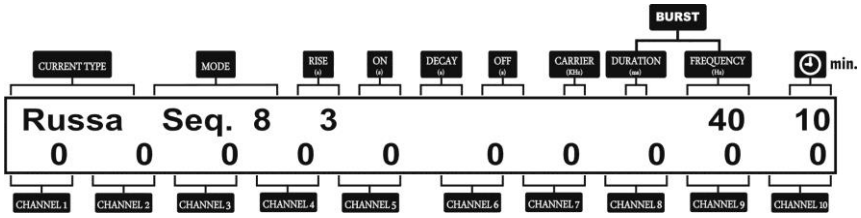
3º step: SET + and SET - (7) control keys: These keys are used to choose the marks of each necessary parameter to the therapy.
SET+ → Increasing values. SET- → decreasing values.
4º step: Control key **START / STOP** (6) – Once respectively selected and chosen the parameters and their values (as described in the previous paragraphs), press the START key. Observe that the parameters stop to flicker. At this moment the program will start. Now choose the current intensity necessary for the treatment. If you wish to interrupt the application, just press the STOP key. The current will be interrupted and the parameters will flicker again in order to perform a new programming. At the end of the programmed time you will hear a sound signal (several "beeps") and the current will stop. Press the STOP key to turn off the sound beep and the equipment will return to the programming condition again. As you can see, there are two functions in the same key. START – beginning the treatment. STOP – stop the treatment.

Example 1:

As described in the 1st step, when connecting the equipment, the screen (5) will display the following:

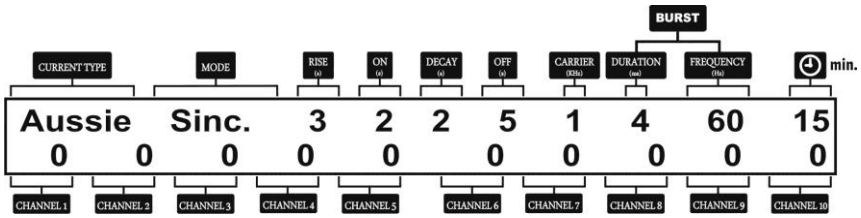


This is the equipment "default", this means, it will always indicate for the first time the RUSSIAN current type, with burst frequency of 50 Hz, stimulation mode Cont. (continuous) and 20 minutes of application.
Let us suppose that you need the SEQUENTIAL stimulation mode with 8 channels. Using the BACK/NEXT (7) keys, go to the MODE parameter so that the cursor remains flickering on the letter C of Cont. Using the SET+/SET - (7) keys, now select Seq. Note that the number 4 is exhibited. Again, using the BACK/NEXT keys (7) go to parameter 4 (cursor flickering on number 4). Again, using the SET+/SET- (7) keys, select number 8, this means eight channels. Always using the BACK/NEXT and SET+/SET - keys, select for example, Rise of 3 seconds, burst frequency of 40 Hz and 10 minutes of application time. Press the START / STOP (6) key. Note that the screen is displaying:



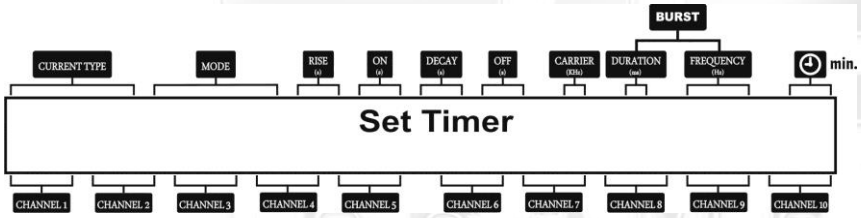
Now the only thing left is to enter the desired intensity in each channel.

Example 2: let us suppose that you want the synchronized Aussie current type, 3 seconds of Rise, 2 of On, 2 of Decay, 5 of Off, Carrying frequency of 1 KHz, Burst Duration of 4 ms, Burst Frequency of 60 Hz and 15 minutes of application. Using the BACK/NEXT (7) go to the parameters and using the SET+/SET - keys (7) select the values. Press the START / STOP (6) key. Note that the screen is displaying:



IMPORTANT OBSERVATIONS ABOUT THE EQUIPMENT

1 – If during the program the application time is 0 seconds, when pressing the START/STOP key (6), a sound (beep) will be generated indicating to select the application time. At this moment the screen (5) will display:



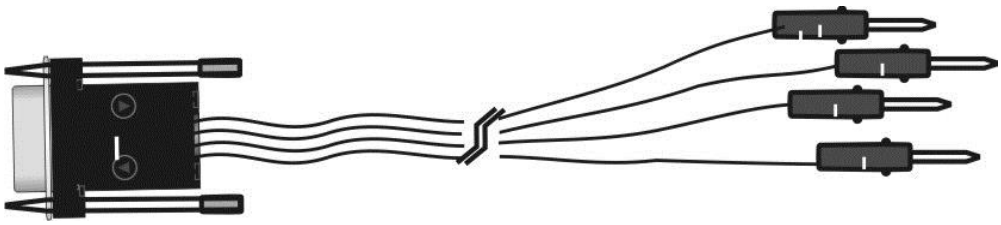
Press again the START key. The sound is interrupted and a cursor in the timer field flickers. Select the time required for the application. Press once more the START key and select the intensity required for the treatment.

2 – When the selected current type is Aussie or Russian, with mode Sync. Alter. Seq. Clea. the LEDs (display lights) of each channel in use "will flicker" in accordance with the selected Rise, On, Decay and Off times (on- indicating Led completely "on", off- indicating Led completely “off”). **We suggest to increase the intensity of the channels only when these LEDs are totally on (maximum contraction).**

3 – When the equipment is operating (with intensity), it will not be possible to alter any parameter. For this, you must stop the treatment using the STOP (6) key and restart a new program.

4- Neurodyn 10 channels has 10 sets (each with four wires) if cables. 5 sets for the Russian and Aussie current and 5 sets for the Electrolipolysis.

The cables used in Russian or Aussie current have **pins** at the tips, as shown below:



Note: These 5 sets with pins on the ends were designed to be used from channel 1 to 10 channel (in accordance with the colors in the equipment panel) and only for Russian, Aussie currents and Electropolysis.

To Electrolipolysis just plug the adapter's alligator clips on the ends of the pins and secure the alligator clips on the cables of the needle electrodes.

NOTE: We suggest that the patient preparation procedures and application of the electrodes are performed before turning on and programmed the equipment.

Reminder (text transcript Performance Essentials): The therapy technique with Russian or Aussie current consists in application of a smooth electrical stimulation by means of electrodes placed on areas of the body. The Electrolipolysis technique consists in application of smooth stimulation though needle type electrodes. The technique with Russian or Aussie current is not invasive and the Electropolysis technique is invasive. The intensity of the current required for the treatment depends on patient's feeling. Thus, the treatment should start with minimum intensity levels (very low), increasing the level carefully until achieving the effects adequate for the procedure and according to the patient's reaction.

The **PROG./MENU** control key **(8):**

The **PROG./MENU** control key **(8)** has two functions: Selection of programs (treatment protocols) and menu. Thus, according to the function we can call it PROG.key or MENU key.

1- Operating as a PROG**.** key: This PROG key is used to select treatment protocols, this means, set programs that are saved in the memory of the equipment.

Turn on your equipment as described in the previous paragraphs. Press the PROG key quickly. The crystal liquid display will indicate the pre-programmed treatment protocols.

Through the SET+/SET- key you can select 20 set treatment programs (protocols) or create and write 10 additional private programs (protocols). Below we provide the 20 pre-programmed protocols:

Original Russian Current for Fiber IIa - flaccidity 1

This protocol should be used when the therapeutic objective is the increase of muscular strength and reduction of the condition of muscular and cutaneous tissue flaccidity. The electrodes should be fixed on the muscular center to be stimulated or on the motor point of this muscle. The stimulation parameters are: F= 2.500Hz, 50Hz modulation frequency in **Burst**, 10ms **Burst** duration and 10ms of inter **Bursts** interval. The therapy intensity should be above the motor threshold and the therapy total time should be equal to 15 minutes. In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 6 seconds, fall time equal to 3 sec. and **off** time equal to 12 sec.

Original Russian Current for Fiber IIa - flaccidity 2

This protocol should be used when the therapeutic objective is the increase of muscular strength and reduction of the condition of cutaneous tissue flaccidity.

The electrodes should be fixed on the muscular center to be stimulated or on the motor point of this muscle. The stimulation parameters are: F= 2.500Hz, 50Hz modulation frequency in **Burst**, 10ms **Burst** duration and 10ms of inter **Bursts** interval. The therapy intensity should be the light motor stimulation and the therapy total time should be equal to 15 minutes. In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 9 seconds, fall time equal to 3 sec. and **off** time equal to 15 sec.

Original Russian Current for Fiber IIa - flaccidity 3

This protocol should be used when the therapeutic objective is the increase of muscular strength and reduction of the condition of cutaneous tissue flaccidity. The electrodes should be fixed on the muscular center to be stimulated or on the motor point of this muscle. The stimulation parameters are: F= 2.500Hz, 50Hz modulation frequency in **Burst**, 10ms **Burst** duration and 10ms of inter **Bursts** interval. The therapy intensity should be the light motor stimulation and the therapy total time should be equal to 15 minutes. In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 12 seconds, fall time equal to 3 sec. and **off** time equal to 18 sec.

Original Russian Current for Fiber IIb - flaccidity 1

This protocol should be used when the therapeutic objective is the increase of muscular strength and reduction of the condition of cutaneous tissue flaccidity. The electrodes should be fixed on the muscular center to be stimulated or on the motor point of this muscle. The stimulation parameters are: F= 2.500Hz, 70Hz modulation frequency in **Burst**, 10ms **Burst** duration and 10ms of inter **Bursts** interval. The therapy intensity should be the light motor stimulation and the therapy total time should be equal to 15 minutes.
In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 6 seconds, fall time equal to 3 sec. and **off** time equal to 12 sec.

Original Russian Current for Fiber IIb - flaccidity 2

This protocol should be used when the therapeutic objective is the increase of muscular strength and reduction of the condition of muscular and cutaneous tissue flaccidity. The electrodes should be fixed on the muscular center to be stimulated or on the motor point of this muscle. The stimulation parameters are: F= 2500Hz, 70Hz modulation frequency in **Burst**, 10ms **Burst** duration and 10ms of inter **Bursts** interval. The therapy intensity should be above the motor threshold and the therapy total time should be equal to 15 minutes. In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 9 seconds, fall time equal to 3 sec. and **off** time equal to 15 sec.

Original Russian Current for Fiber IIb - flaccidity 3

This protocol should be used when the therapeutic objective is the increase of muscular strength and reduction of the condition of muscular and cutaneous tissue flaccidity. The electrodes should be fixed on the muscular center to be stimulated or on the motor point of this muscle. The stimulation parameters are: F= 2.500Hz, 70Hz modulation frequency in **Burst**, 10ms **Burst** duration and 10ms of inter **Bursts** interval. The therapy intensity should be above the motor threshold and the therapy total time should be equal to 15 minutes. In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 12 seconds, fall time equal to 3 sec. and **off** time equal to 18 sec.

Russian current for lymphatic drainage

This protocol should be used when the therapeutic objective is the increase of lymphatic drainage. Remembering that this therapeutic procedure should not replace the manual

lymphatic drainage, it is possible to intercalate manual treatments with electric stimulation sessions. The electrodes should be fixed in the regions corresponding to the direction of the lymphatic vessels. For this type of stimulation, the sequential mode should be used so that the lympha content displacement is stimulated from distal to proximal in the direction of the reference ganglions. The stimulation parameters are: F= 2,500Hz, 35Hz modulation frequency in **Burst**, 10ms **Burst** duration and 18ms of inter **Bursts** interval. The therapy intensity should be the light motor stimulation and the therapy total time should be equal to 15 minutes. In order to control the levels of fatigue, the gradient modulation is required with the rise time equal to 3 sec. **on** time equal to 16 seconds, fall time equal to 3 sec. and **off** time equal to 32 sec.

Aussie Current for Fiber IIa - flaccidity 1

This protocol should be used in treatment of muscular and cutaneous flaccidity. The therapy parameters used are F=1,000Hz, 2ms of **Burst** duration, 50Hz of **Burst** modulation frequency**.** The gradient modulation should be constructed with a rise time equal to 3 seconds, followed by 6 seconds of contraction, and fall time of 3 seconds and 12 seconds off. For stimulation, the electrodes should be positioned in the muscle motor points to be stimulated or in the muscular center of the muscles to be stimulated. The stimulation intensity should be above the motor threshold, but tolerable to the patient. Treatment can be made on a daily basis, respecting the muscular fatigue levels generated for each stimulation individual session.
The duration time of each session should not be superior to 20 minutes. Note that the selected **Bursts** frequency (50Hz) is recommended to stimulate the type IIa muscular fiber motor neurons, this means mixed fibers with oxidative and glycolytic characteristics.

Aussie Current for Fiber IIa - flaccidity 2

This protocol should be used in treatment of muscular and cutaneous flaccidity. The therapy parameters used are F=1,000Hz, 2ms of **Burst** duration, 50Hz of **Burst** modulation frequency**.** The gradient modulation should be constructed with a rise time equal to 3 seconds, followed by 9 seconds of contraction, and fall time of 3 seconds and 15 seconds off. For stimulation, the electrodes should be positioned in the muscle motor points to be stimulated or in the muscular center of the muscles to be stimulated. The stimulation intensity should be above the motor threshold, but tolerable to the patient. Treatment can be made on a daily basis, respecting the muscular fatigue levels generated for each stimulation individual session. The duration time of each session should not be superior to 20 minutes. Note that the selected **Bursts** frequency (50Hz) is recommended to stimulate the type IIa muscular fiber motor neurons, this means mixed fibers with oxidative and glycolytic characteristics.

Aussie Current for Fiber IIa - flaccidity 3

This protocol should be used in treatment of muscular and cutaneous flaccidity. The therapy parameters used are F=1,000Hz, 2ms of **Burst** duration, 50Hz of **Burst** modulation frequency**.** The gradient modulation should be constructed with a rise time equal to 3 seconds, followed by 6 seconds of contraction, and fall time of 3 seconds and 18 seconds off.
For stimulation, the electrodes should be positioned in the muscle motor points to be stimulated or in the muscular center of the muscles to be stimulated. The stimulation intensity should be above the motor threshold, but tolerable to the patient. Treatment can be made on a daily basis, respecting the muscular fatigue levels generated for each stimulation individual session. The duration time of each session should not exceed 20 minutes. Note that the selected **Bursts** frequency (50Hz) is recommended to stimulate the type IIa muscular fiber motor neurons, this means mixed fibers with oxidative and glycolytic characteristics.

Aussie Current for Fiber IIb - flaccidity 1

This protocol should be used in treatment of muscular and cutaneous flaccidity. The therapy parameters used are F=1000Hz, 2ms of **Burst** duration, 70Hz of **Burst** modulation frequency**.** The gradient modulation should be constructed with a rise time equal to 3 seconds, followed by 6 seconds of contraction, and fall time of 3 seconds and 12 seconds off. For stimulation, the electrodes should be positioned in the muscle motor points to be stimulated or in the muscular center of the muscles to be stimulated. The stimulation intensity should be above the motor threshold, but tolerable to the patient. Treatment can be made on a daily basis, respecting the muscular fatigue levels generated for each stimulation individual session. The duration time of each session should not be superior to 20 minutes. Note that the selected **Bursts** frequency (70Hz) is recommended to stimulate the type IIa muscular fiber motor neurons, this means mixed fibers with oxidative and glycolytic characteristics.

Aussie Current for Fiber IIb - flaccidity 2

This protocol should be used in treatment of muscular and cutaneous flaccidity. The therapy parameters used are F=1,000Hz, 2ms of **Burst** duration, 70Hz of **Burst** modulation frequency**.** The gradient modulation should be constructed with a rise time equal to 3 seconds, followed by 9 seconds of contraction, and fall time of 3 seconds and 15 seconds off. For stimulation, the electrodes should be positioned in the muscle motor points to be stimulated or in the muscular center of the muscles to be stimulated. The stimulation intensity should be above the motor threshold, but tolerable to the patient. Treatment can be made on a daily basis, respecting the muscular fatigue levels generated for each stimulation individual session. The duration time of each session should not be superior to 20 minutes. Note that the selected

Bursts frequency (70Hz) is recommended to stimulate the type IIa muscular fiber motor neurons, this means mixed fibers with oxidative and glycolytic characteristics.

Aussie Current for Fiber IIb - flaccidity 3

This protocol should be used in treatment of muscular and cutaneous flaccidity. The therapy parameters used are F=1,000Hz, 2ms of **Burst** duration, 70Hz of **Burst** modulation frequency**.** The gradient modulation should be constructed with a rise time equal to 3 seconds, followed by 12 seconds of contraction, and fall time of 3 seconds and 18 seconds off. For stimulation, the electrodes should be positioned in the muscle motor points to be stimulated or in the muscular center of the muscles to be stimulated. The stimulation intensity should be above the motor threshold, but tolerable to the patient. Treatment can be made on a daily basis, respecting the muscular fatigue levels generated for each stimulation individual session. The duration time of each session should not be superior to 20 minutes.

Note that the selected **Bursts** frequency (70Hz) is recommended to stimulate the type IIa muscular fiber motor neurons, this means mixed fibers with oxidative and glycolytic characteristics.

IMPORTANT Point: Evolution of protocols 8-9 and 9-10 should be made respecting the adaptation of the stimulated skeletal musculature. The weekly stimulation frequency directly influences the transition of protocol 8-9 and 9-10. With 3 weekly sessions, the evolution can be made every three weeks. The same is valid for evolution of protocols 11-12 and 12-13.

Muscular strengthening in athletes

Muscular strengthening in athletes The objective of this program is to provide the increase of the muscular strength in normal individuals, this means, without neuro-osteomioarticular system dysfunction. The parameters for stimulation are alternate current with frequency equal to 1kHz with a **Burst** duration equal to 2 ms. The **Burst** frequency should be equal to 50 Hz. Thus, the maximum muscular contraction will be produced. The modulation in gradient should be of 1 second in rise, 9 second in contraction, 1 second in fall and 50 seconds in off time. The gradient is similar to the one used in the Russian current, however, the torque production is greater and the muscular fatigue smaller. Positioning of electrodes should be made on the motor point and the intensity should be the motor stimulation that the patient can bear. The stimulation can be made on a daily basis during 20 minutes or by the number of required contractions. It is important that the stimulation combine with voluntary exercises.

Motor re-education

Motor re-education**.** This program should be used with the objective of motor facilitation and motor re-learning. For stimulation, the carrying frequency of 4 kHz is used with a **Burst** duration equal to 4ms. The **Burst** frequency should be equal to 50 Hz. The gradient is used with 1 second of rise time, 3 seconds of contraction, 1 second of fall and 3 seconds of rest time or **off** time. For stimulation the electrodes should be positioned in the muscular motor points or in the center of the skeletal muscles. The stimulation should be strong enough to provoke the muscular contraction, this means, the stimulus should be given above the motor threshold. The stimulation frequency can be daily and the duration time of each session can vary from 10 to 20 minutes.
With the re-education program through the **AUSSIE** current, a comfortable activation of the skeletal muscles will occur as well as the propagation of afferent stimuli promoting sensorial inputs to the central nervous system. In case of pain due to tissue lesion, the central nervous system will inhibit automatically a specific muscle or a group of muscles. After recovery of the structure, if the inhibition persists, use of the electric stimulation will be needed through the Aussie current so that the functional motor activities can occur again normally. The muscular fatigue can easily occur, thus, short sessions of treatment should be prioritized. To help in training, the patient should maintain the concentration in visualization of the motor task, thus, the voluntary involvement will be mandatory for the success of the treatment.

Strengthening after atrophy due to lack of use

Strengthening after atrophy due to lack of use: This protocol should be used in patients that present muscular atrophy due to lack of use.
The frequency parameters used are 1 kHz of frequency with **Bursts** with duration of 4 ms and frequency equal to 15 Hz. The gradient modulation should be constructed with a rise time equal to 1 second, followed by 9 seconds of contraction, and fall time of 1 second and 9 seconds off. The electrodes should be positioned at the muscular motor points or on the muscular center and the intensity should be higher than the motor threshold however tolerable by the patient. Treatment can be offered daily, respecting the muscular fatigue levels generated by each individual stimulation session and the duration time of each session should be of 20 minutes. It is important to highlight that the selected **Burst** frequency (15 Hz) is recommended to stimulate the motor neurons of the muscular fiber resistant to fatigue. This stimulation standard can revert the metabolic and structural changes that occur in the skeletal muscles as a result of the lack of use (I to IIA) Bursts frequencies higher than 20 Hz may strengthen the muscles but do not revert the transformation muscular fiber types. The low frequency of Bursts (15 Hz) allow the gradient modulation to have a short total time without increasing the fatigue risk, and thus, the muscle is stimulated for a greater period of time during the treatment session.

FES after AVC

Functional Electric Stimulation After a stroke (AVC): This program should be used to prevent the muscular atrophy due to the lack of use, prevent the shoulder sub-luxation after occurrences of AVC and also to facilitate the motor re-learning. For the stimulation the carrying frequency should be 4 kHz, with Bursts duration of 4 ms. These stimulation parameters will provide a more comfortable stimulation to the patient. The **Burst** frequency should be equal to 15 Hz. The stimulus intensity should be the motor stimulus and the gradient modulation should present a rise time of 1 second, the contraction time of 9 seconds, and fall equal to 1 second and 9 seconds of off.
The Bursts low frequency allows that the off period be short but the fatigue risk is low due to the parameters of the carrying current and duration of Bursts. For stimulation the electrodes should be positioned in the muscular motor points or in the center of the dysfunctional skeletal muscles. The stimulation time may vary from 10 to 20 minutes. The Bursts frequency can be modified by the therapist. 10 Hz frequencies can be adopted if the physiotherapist notices that a functional muscular contraction exists with the value of 15 Hz. If the same 15 Hz cannot elicit muscular contractions, the frequency should be increased to 20 Hz. Values above 20 should be avoided as they can reduce the conversion between the muscular fiber types in patients subject to AVC or patients that present medullary lesions.

Reduction of edema e lymphatic drainage

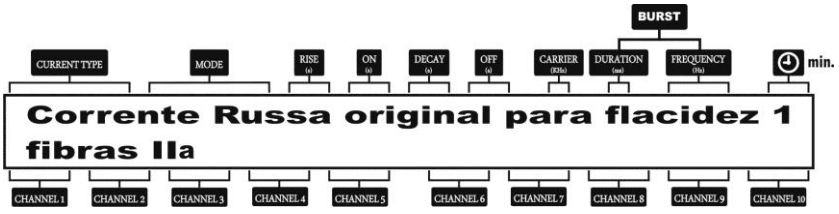
Reduction of edema e lymphatic drainage This protocol covering use of AUSSIE current should be used to control and reduce the edema as well as for the lymphatic drainage procedures. The stimulation will promote a subtle and repeated muscular contraction producing an action of muscular pumping. For stimulation the AUSSIE current should be used with a frequency of 4kHz and Bursts duration equal to 4 ms. The Burst modulation frequency should be equal to 35 Hz. As the muscular contraction intensity will be low, the fatigue caused to the muscle will not be significant. The gradient modulation should be performed with a rise time equal to 1, contraction time equal to 5 seconds, fall time equal to 1 second and off time equal to 4 seconds. Thus, the muscular pumping action will be optimized. The electrodes for stimulation should be positioned in the center of the skeletal muscles that correlates directly with the edema, for example, if the edema is located in the side region of the ankle, one channel of the electrodes should be positioned in the medial and lateral gastrocnemius. The stimulation intensity should be the light muscular contraction.
The sessions should have a maximum duration of 20 minutes. When lower is the stimulation frequency, higher will be the changes of activation of the slow contraction muscular fibers.

Pain modulation by the rising mechanism

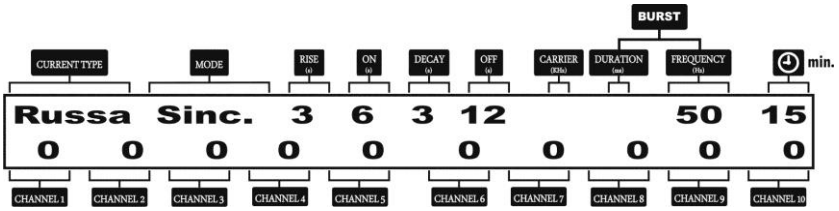
Pain modulation by activation of rising mechanism: The objective of the use of this protocol is to promote the analgesia by activation of the pain gate. For the stimulation, the frequency of 4kHz with Bursts duration equal to 4 ms is used. The Bursts frequency should be equal to 100 Hz and the stimulation should be applied in an on-going manner this means, without the gradient modulation. The electrode positioning should be made in the dermatome related to the referred pain and the stimulation intensity should an intense sensorial. Treatment duration should be short and preferably equal to the time of a second intervention performed to the patient, such as for example, exercises of kinesiotherapy. The stimulation parameters should be selected so as to activate the A-beta neural fibers. The objective is to produce the gate effect in the pain as described several years ago by Melzac & Wall (1965). The pain gate mechanism involves activation of the sensorial fibers of rapid conduction which activate the inhibiting interneurons at level of the spinal medulla inhibiting transmission of the nociceptive stimuli in direction to the central nervous system. These stimulations are conducted by fibers A Delta and C.

Pain modulation by the descending mechanism

Pain modulation by activation of descending mechanism: This protocol has the capacity to promote the analgesia by stimulation of the descending mechanism related to release of endorphins. To do this, the Aussie current is used in the 1kHz frequency, with Bursts duration equal to 2 ms, the Bursts frequency should be equal to 100 Hz.
The stimulation should be applied in an on-going manner, this means, gradient modulation is not required. For stimulation two electrode channels should be used, whereas one pair of electrodes positioned on the pain point and the other pair of electrodes on the neural root corresponding to the pain point. The intensity must be an intense sensorial stimulation. The theory says that the stimulation should be able to activate the enkephalinergic interneurons in the medullary grayish substance, releasing the enkephalins in specific layers of the spinal medullary grayish substance, thus preventing the passage of the nociceptive pulses to the SNC. The stimulation time should be 20 minutes and the effects of the analgesia can prevail for two years after the end of the stimulation.
Selection example of a pre-programmed protocol: Turn on the equipment as described in the previous paragraphs. Press the PROG key quickly. The following information will be exhibited in the equipment display:

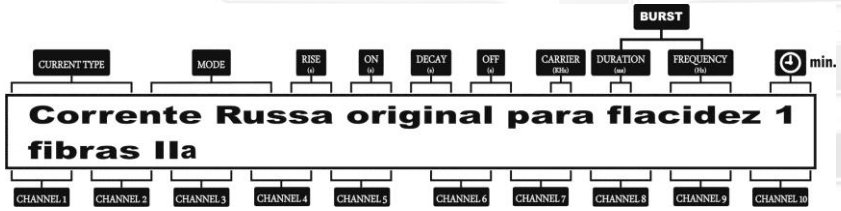


This is the first treatment pre-programmed protocol that is in the equipment memory. Through the SET+/SET- keys, you can select another. Supposing that this is the selected protocol. Press once more the PROG. key The equipment display will indicate parameters ready for that treatment.

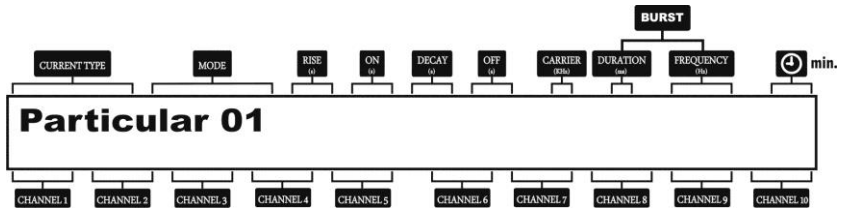


Now the only thing left is to press the START key for the selected program to be executed.
Now the only thing left to do is to select the desired current intensity.

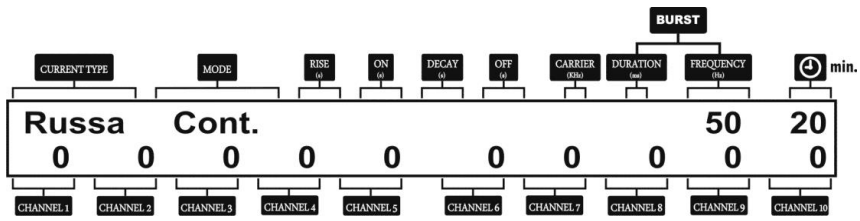
Selection example of a particular protocol: Turn on the equipment as described in the previous paragraphs. Press the PROG key quickly. The following information will be exhibited in the equipment display:



As already seen previously, this is the first treatment pre-programmed protocol that is in the equipment memory. Remember that there are 20 pre-programmed protocols. Go through all of them using the SET+/SET- keys until the Particular 1 program is selected. The following information will appear on the equipment display:

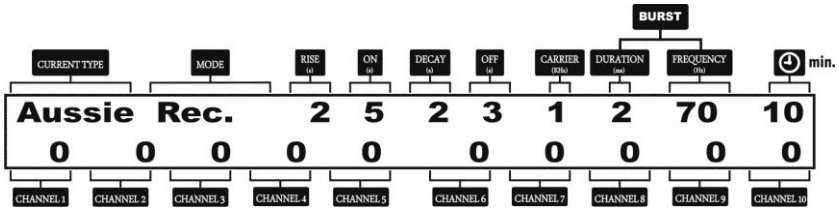


Press again the PROG. key and the equipment “default” screen will be exhibited:



Note the cursor flickering in the Application Time field. The equipment is ready to receive any programming.

Example: Supposing that we shall have a treatment with Aussie current and a carrying frequency = 1KHz, burst duration = 2ms and burst repetition frequency = 70Hz, application time of 10 minutes, in the alternate mode with rise = 2s, on = 5s, decay = 2s and off = 3s. As described in previous paragraphs, select the parameters for this treatment. The display will indicate:



Now press the START key. At this moment, the cursor will stop flickering. The equipment wrote this programming with the name of Particular 01. Just give the necessary intensity to the treatment. Whenever the equipment is turned on and the protocol Particular 01 is selected, this programming will be written in the memory. There are 10 particular protocols, out of which the professional selects the parameters and writes them in the equipment memory. If one of these protocols should be changed, just select new parameters and write them on top of the existing ones.

NOTE: The way to select any of the 20 ready pre-programmed protocols or to create up to 10 particular protocols is always the same. It is necessary to follow the above mentioned steps.

Types of muscular fibers: Influence and decision on the use of excite-motor currents in muscular stimulation.

For the adequate use and prescription of the excite-motor currents, it is important to highlight that the skeletal muscles do not contain only a homogeneous group of muscular fibers with similar metabolic, structural and contraction properties.

Thus, along the time and after several scientific researches, that in a way generated common and disagreement points among the researchers during the last few years, two different types of muscular fiber were identified and classified according to their contraction and metabolic characteristics.

The evaluation of each heavy chain of the myosin molecule helps the identification of different types of muscular fibers. The chain may be presented in at least three different forms. The analysis evaluates the degree of the fiber differential sensibility to a changed pH of the myosin enzyme. ATPase (it is a measurement of the myosin phenotype).

The different characteristics of this enzyme define the quickness with which the hydrolysis of the ATP occurs in the region of the heavy chain of the myosin and thus, the

speed of shortening of the muscular sarcomeres. In a specific manner, an acid pH deactivates the activity of the myosin ATPase in the rapid contraction fibers, however, this enzyme continues reasonably stable with a pH in the alkaline variation, thus, these fibers acquire a dark color for this enzyme.

On the other side, the ATPase myosin activity specific for the slow contraction fiber continues high in an acid pH, but it becomes inactive in an alkaline environment. These fibers acquired a clear color for the ATPase myosin.

Generally, the muscular fibers can be classified as being of rapid contraction and slow contraction. The rapid contraction muscular fibers exhibit the following characteristics:

- High capacity for electrochemical transmission of action potential;
-.High activity of the ATPase myosin;
- Rapid release and capture of Ca2+;
- High rate of Turnover of the crossed bridges.

The factors described above directly contribute to the rapid generation of energy of these fibers so that the muscular contractions are rapid and strong. The shortening intrinsic speed and the tension development by rapid contraction fibers are three to five times greater than for the fibers classified as being of slow contraction. The rapid contraction fibers use the glycolytic system at short term to obtain and transfer the energy and this explains why the activation of the fibers predominates in the high speed and short duration activities also known as anaerobic activities, which depend directly of the anaerobic metabolism. The rapid contraction fibers are directly associated to the hypertrophy power that a muscle or muscular group presents and thus, understand the behavior as well as the characteristics of these fibers is of extreme importance for the treatment of flaccidity conditions and functional recovery in athletes.

The hypertrophy high power fibers frequently require a rapid supply of power that can only be generated by means of the anaerobic paths. The quantity of this type of muscular fiber in human beings suffers the direct influence of genetic factors.

And, the slow contraction fibers generate power for the predominant ATP synthesis by means of the oxidative metabolism, or aerobic metabolism as it is known and their main characteristics are:

- Relatively slow activity of the ATPase myosin;
- Minor manipulation capacity of the calcium and slower shortening speed;
- Low glycolytic capacity;
- Large number of mitochrondial;
- Large mitochrodials.

The large and numerous mitochrondials as well as the corresponding cytochromes that contain iron, combined with the high levels of myoglobine provide the slow contraction fibers their traditional reddish pigmentation. The high concentration of mitochrondial enzymes, necessary for maintenance 0f the aerobic metabolism, is related in a close maintenance to the enhanced metabolic question through the slow contraction fiber. Thus, with these characteristics, these muscular fibers become highly resistant to the fatigue and perfectly adequate to the long duration aerobic exercises. The fibers can also receive the denomination

of S.O. (slow-oxidative). Such denomination is adequate to describe their slow shortening speed as well as its dependence in relation to the oxidative metabolism. The type 1 muscular fibers or of slow contraction are recruited (their motoneurons) in a selective manner during the several motor activities, this means, they are recruited in an unordered manner according to the requirements imposed by the developed motor tasks. The irrigation of the slow contraction muscular fibers is abundant due also to its metabolic and functional metabolic activity, with need of high quantity of blood vessels so that the metabolic operation can be perfect.

The researchers classify the slow contraction fiber as type I and the rapid contraction fibers as type II and these fibers subdivided into IIa and IIb. The sub-divisions that characterize the type II muscular fibers indicate that: The type IIa fiber, this means the intermediate fiber exhibits a high speed shortening and a capacity moderately well developed for transfer of power from the fonts such as aerobic (high level of succinic dehydrogenase aerobic enzyme, or SDH) or anaerobic (high level of phosphofructokinase anaerobic enzyme or PFK).

These fibers represent the **rapid-oxidative-glycolytic fibers(ROG)**. The other sub-division, the IIb (also denominated type IIx) has a greater anaerobic potential and thus, its contraction speed / relax is much larger, thus this fiber is classified as the true type II fiber, rapid-**rapid-glycolytic fiber (RG)**.

A rare and undifferentiated type of fiber, IIc, can contribute to the reinnervation and transformation of the motor unit of the muscular fiber.

The table below indicate the main characteristics of the different types of muscular fibers:

Characteristics	**Type IIb**	**Type IIa:**	**Type I:**
Standards of electric and morphologic activity	**Phasic, high frequency CRB**	**CRA**	**Tonic, low frequency CL**
Color	White	White / red	Red
Fiber diameter	Large	Intermediate	Small
Capillary /mm2	Low	Intermediate	High
Mitochondrial Vol.	Low	Intermediate	Alta
Hystochemical and Biochemical	**Type IIb**	**Type IIa:**	**Type I:**
ATPase Myosin	High	High	Low
Calcium	High	Medium/High	Low
Cap. Glycolytic	High	High	Medium
Cap. Oxidative	Low	Medium/High	High
Function and Contractility	**Type IIb**	**Type IIa:**	**Type I:**

Contraction. Speed	Rapid	Rapid	Slow
Relax . Speed:	Rapid	Rapid	Slow
Resistance to fatigue	Low	Moderate/High	High
Capacity to generate Power	High	Intermediate	Low

In general the muscular fibers present a high power of change in their form and function as a result of the stimulation applied. The fiber size can change and a conversion from a given type of fiber to another can also occur. The muscular fiber hypertrophy can occur as a result of chronic training through stimulation of strong muscular contractions whether they are voluntary or electrically induced. Changes in the muscular fiber types occur mainly due to the stimulation frequency. For the type I muscular fibers, this means, the oxidative and fatigue resistant fibers, the low stimulation frequencies (10Hz) are ideal. In this case, the stimulation time should be increased. Studies suggest that the type of muscular fiber as well as the several changes that can occur as a result of the training are defined by the neuron stimulation.

For the type II (a, b) muscular fiber stimulation (a, b), the literature indicates higher frequency values whereas 50Hz for the IIa fibers and up to 70Hz for the IIb fibers. However, independently of the type of muscular fiber, the therapy intensity should be above the motor threshold. Remembering that when the stimulation is performed with frequencies above 50Hz the possibility of muscular fatigue occurrence is even higher.

Tissue-Type Flaccidity

The tissue-type flaccidity is an affection related to the muscular and cutaneous tissue. When we talk about cutaneous flaccidity, we should remember that the skin in a viscoelastic material and thus, it deformation capacity is real, however, limited. Such deformation capacity can be divided in three different phases graded from 1 to 3:

1 - Elastic phase: after receiving a given deformation overcharge, the skin returns rapidly to its normal condition and state.

2 - Floating phase: is characterized as being the elastic limit, this means, this means, from this point on the skin is unable to recover its formal form.

3 - Plastic phase: is characterized as a phase in which, after removal of the stimulation, the skin is unable to return or recover its normal structural condition.

The tissue-type flaccidity can be originated by some factors, which can be divided in intrinsic and extrinsic. As intrinsic factors are the physiologic aging, hormonal factors such as metabolic diseases (diabetes, Syndrome of Cushing and Grave's disease. As extrinsic or environmental factors are: the xerodermia, sedentary condition and slimming.

The physiologic aging is characterized by a series of changes that affect several organs and corporal systems. Along the life time and as from the age of 30 years, significant changes

take place in the maximum consumption of oxygen (VO2máx), in the respiratory capacity, in the bone, articular and ligament structures composition, in the sensorial, visual, digestive, metabolic, cutaneous and also muscular systems. Thus, a reduction in quantity of type II muscular fibers occurs, this means, rapid contraction fibers, this automatically results in muscular flaccidity due to reduction in quantity of contractible muscular tissue. As related to the skin, it is known that the physiologic aging will cause a great impact on the collagenous and elastic fibers that provide sustentation to the dermis and epidermis, as well as significant changes in the skin arterial, venous and lymphatic vascular system.

The xerodermia is a concept directly related to skin hydration. To allow the different layers of the skin to maintain integral their capacities related to elasticity, flexibility and also resistance, significant presence of water is required. The dehydrated skin will present an opaque and peeling off aspect in addition to the visual and physical slabbing feeling felt by the patient.

The loss of transepidermical water results in a significant reduction of elasticity as well as in changes in the biomechanical properties related to the skin. The cutaneous hydration may suffer direct influence from the following factors:

- Quantity of water drank on a daily basis;
- Quality of water transportation to the lower layers;
- Water evaporation speed, which suffers direct influence of the environment;
- Keratinization quality and speed;
- Quantity and composition of epicutaneous emulsion.

It is easy to understand that the lack of request from the muscular system can result in the atrophy of its cells, and thus, the flaccidity condition presents direct relation with the sedentary condition, which should be classified as an environmental factor related to the problem.

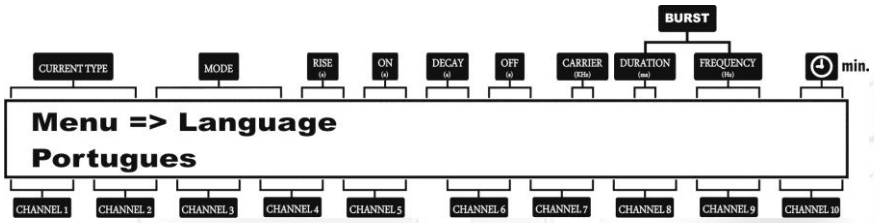
Slimming or loss of weight can occur due to several conditions such as changes in nourishing habits, ingestion of drugs with diuretic and laxative principles. It is important to highlight that the drugs used in treatments with corporal control or loss of weight objective contain in their formula thyroid stimulating hormones or derivates and these may result in development of hypertheroidism. On the other hand the diuretics and laxatives may result in dehydration conditions as they increase the loss of ions and minerals important for the organic equilibrium and maintenance of cutaneous hydration.

The hormonal factors present strong influence on the cutaneous flaccidity conditions as in a direct manner they increase the degradation of the human body proteins. These are conditions found in the Diabetes of Syndrome of Cushing. In the Grave's disease and hyperthyroidism, we have a significant increase of the general corporal metabolism. Thus, the degradation of skeletal muscular fibers and even the development of thiroitoxical miopathy conditions may occur. The chronic stress generated by the seizure of the GLUT-4 transporter, which is responsible for transportation of the glucose to the muscle, generates the reduction of the quantity of glycogen stored in the muscle and this results in the atrophy of the tissue due to lack of nutrients and substances for maintenance of muscular metabolism.

It is easy to understand the role of the N.M.E.S. (Aussie and Russian) as a therapeutic resource associated to other techniques in treatment of tissue-type flaccidity.
Training through use of excitomotor current will result in increase of the muscular trophism mainly by the response obtained from the adaptation of type II muscular fibers, this means, IIA and IIB. The protocols suggested for treatment of the flaccidity try, in their essence, to promote the adaptation of these fibers to the training and thus, reduce the symptomalogic and structural manifestations generated by the flaccidity

2 - Functioning as **MENU** key: This MENU key is used to select the text language indicated in the liquid crystal display. There are three language options: Portuguese, English and Spanish. To access the language menu, press the menu key during a few seconds until 3 beeps are heard.

The liquid crystal display will indicate for example:

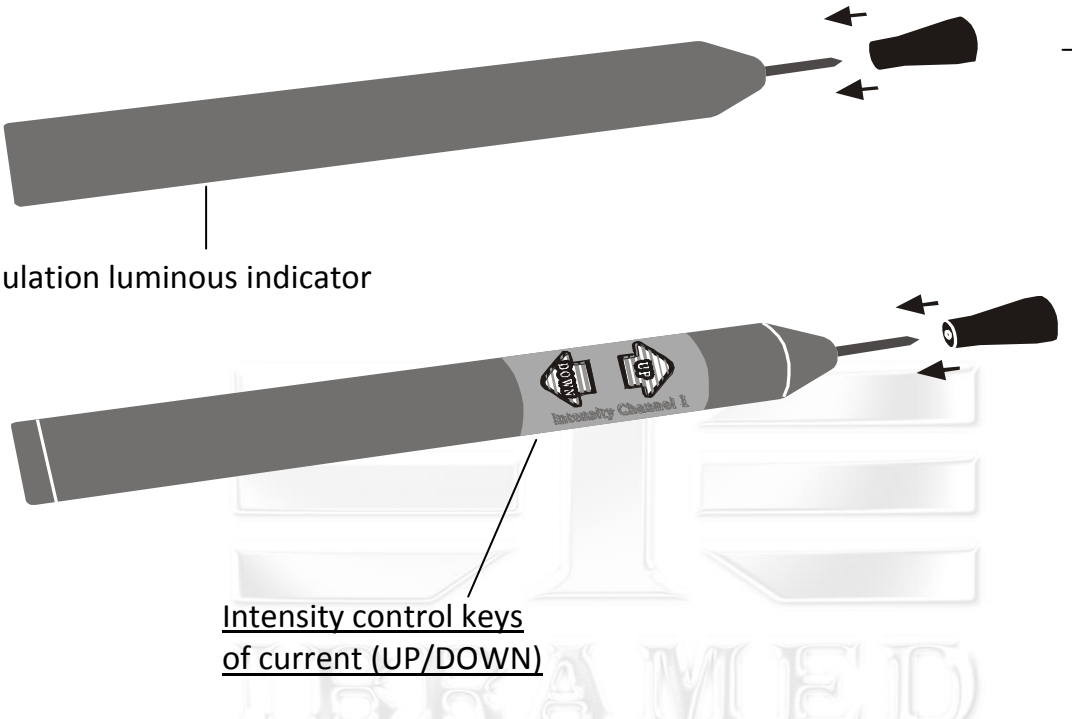


Through the Set + / Set – keys select the most adequate language. Quickly press the Menu key so that the selected language can be retrieved.

Whenever the equipment is turned on, the last selected language will be executed.

Pen for Facial Stimulation

The NEURODYN 10 channels also allows for facial stimulation (Russian or Aussie current) with special pen type electrodes. These are two appropriate pens with conductive silicone rubber electrodes connected to the ends. This pair of pens must only be used in channel 1 of the NEURODYN 10 channels. In the body of the pen there are two intensity control keys, this means you increase or decrease the intensity of the current in a practical manner, without the need to remove them from the equipment panel.



Observations regarding the facial stimulation pen:

1- In order to use the stimulation pens, the selected type of current must be RUSSIAN or AUSSIE.
2- Always use the conductive silicone rubber pen tip correctly inserted onto the tip of the pen. NEVER USE THE METAL TIP DIRECTLY ON THE PATIENT'S SKIN.
3- Luminous stimulation indicator – it indicates the presence of an output to the patient, this means, it indicates that there is stimulation, current on the tip of the pen. After programming the equipment, as long as it is connected in CONT. stimulation mode (continuous), this indicator will remain continuously on. When the stimulation mode is SYNC. (synchronized), this indicator "will flicker" in accordance with the On Time, OFF Time, Rise and Decay times.). We suggest to always increasing the intensity during the

On Time (on) cycle. Normally, the REC modes (alternate) and DES (clearing) are not used with the stimulation pens.

4- Always use the gel supplied with the equipment or a different electric conductive product between the conductive rubber tip and the skin.
5- The stimulation pens are used in channel 1 of the equipment. This will not prevent channels 2 to 10 from being used in other regions of the body at the same time.

Electrostimulation - Introduction

Basically, all the functions and activities of the body involve a form of electricity. When we apply an electrical signal on the human body, using two different plates with different potentials, we have an impedance composed of two resistances as circuit charge, it varies according to the resistance caused by the cutaneous surface: unit, temperature, oil level, area of the skin subject to current (area of the electrode), thickness of the skin, presence of hair, thickness of the adipose tissue, solution of continuity, distance between the electrodes, etc.

The **NEURODYN 10 channels** is modern equipment in the sense that it uses one type of current different from traditional electrostimulation programs (E.E.) in the esthetics area, where polarized currents, mainly represented by faradic current which had a special importance.

The inconvenience in the use of polarized currents for the E.E. programs used today lies in the capacity of these currents to cause a polarization under the electrodes, due to an irregular ionic flux. The faradic pulse shape is triangular and because of this format the width of the pulse is of higher duration. This higher duration will be partly responsible for a higher discomfort caused by the faradic current once the pain threshold is reached by a lower amplitude of the pulse, additionally because of its pointy shape, it will need a high output current amplitude to promote motor contraction, this is why the sensation of the E.E. faradic current is uncomfortable.

The medium frequency currents (Russian and Aussie currents) present several advantages when compared to the low frequency current.

One of the advantages is related to the body's resistance (impedance) to the conduction of electrical current. Since the impedance of the human body is capacitative and it is known that in capacitative systems, the higher the frequency, the lower the resistance will be and consequently the more comfortable the current will become. Another important factor is that, due to a lower resistance of the human body to the passage of current, the muscular stimulation level will be much deeper, in function of the possibility to increase the amplitude of the current.

The success of the E.E. programs depends largely on the stimulation parameters. For a more effective utilization of E.E., the professional needs to thoroughly know all the parameters and to know when and how to regulate them to make them more convenient to a particular treatment program of a certain patient.

The E.E. neuromuscular electrical stimulation is the application of electrical current which is intended to promote muscular contraction, Treat muscular hypotrophy, spasticity, contractures and strengthening, additionally athlete training programs, generating a isometric torque gain of up to 44%, which can present countless different protocols (PICHON et al., 1995). Together with kinesiotherapy, the E.E. has been one of the widely used resources to induce strengthening and muscular hypertrophy, especially from the mid 70's (NORONHA et al., 1997).

The Russian current is characterized by presenting a sinusoidal signal (sometimes square) of a frequency equal to 2,500 Hz, modulated by a bouncing frequency of 50 Hz with Duty cycle of 50%, thus obtaining three pulse trains with a duration of 10 milliseconds, also with intervals of 10 milliseconds. Specifically for myoelectric stimulation, this type of pulse is much higher than faradic current, in the sense that its continuous component is zero, minimizing the ionization of the skin under the electrodes, besides the fact that the sensory-motor stimulus is more comfortable.

According to CABRIC et al. (1988), some others maintain that they have found morphofunctional modifications (increase in the nuclear portion) in muscles trained with electrical stimulation.

The same authors, who have researched the effects of stimulation with Medium Frequency currents and high intensity currents, conclude that:

1) the electrical stimulation causes hypertrophy of muscle fibers (type II – 50% ad type I – 20%);

2) the internal nuclear volume had a tissue increase of 25%;

3) the size and volume of the fibers are completely related with the volume of the micronuclei;

4) the increase of cell activity leads to cellular Hypertrophy and parallel to the increase of nuclear activity.

5) larger fibers mean less fibers per volume and area unit, thus the number of nuclei per fiber must increase and the increase of the volume indicates the increase of the number of nuclei, individually during the stimulation;

6) the type and the frequency of the stimulation are essential for the effects on micronuclei;

7) the increase in the mitochondrial size was much greater in type II fibers than in type I fibers, this can demonstrate that the stimulation regime with medium frequency and high amplitude of current would be more oriented for power than for resistance and generally, currents of medium frequency and high intensity have a higher effect on type II fibers.

The effect of muscular strengthening was attributed by MUNSAT et. al. (1976) an average increase of 37% in the diameter of the muscle fibers during the electrical stimulation program.

Muscular Strengthening Program

According to VILLAR et al. (1997), electrical stimulation is a technique used for muscle re-education, retardation of atrophy, temporal inhibition of spasticity, reduction of contractures and edemas, it is also useful to increase muscular strength in which major motor units are preferentially recruited. Many authors verified the hypertrophy of muscle fibers, through muscle biopsy, pre and post treatment with E.E.

Hypertrophy of a muscle means to increase its motor power (increase of the number of parallel sarcomers), the diameter of the individual muscle fibers and the total number of myofibrils (that come into play in the contraction) and increasing the nutrition mechanisms for their maintenance (ATP – triphosphate adenosine, PC – creatine phosphate, glycogen, etc.). The hypertrophy results in a vigorous muscular activity, counter-resisting. Thus, there is no trophic effect on the muscle if it does not work, the electrostimulation must work against the resistance of a charge with enough intensity to induce potent muscular contractions.

The electrostimulation can be successfully used to assist patient with active exercise, with counter resistance exercise or simply against gravity. Some precautions must be taken so that the muscle is not fatigued too much by a very intense electrostimulation program. The number of contractions that the muscle presents must be controlled, the modulation in gradient, the frequency variation and the intensity of the current are factors to be considered. Thus, many programs can switch the E.E. with the voluntary muscle contraction or even perform them concurrently. These protocols can be more effective for patients that need specific muscle group strengthening, for example, abdominal muscles or vastus medialis, etc.

The normal contraction of skeletal muscle fibers is directed by the motor nerves. These nerves branch out into the conjunctive tissue of the epimisium, where each nerve creates numerous ramifications. A nerve fiver can innervate a unique muscle fiber and then it can branch out and innervate up to 150 or more muscle fibers. In the innervations area, the nerve loses its sheath of myelin and forms a dilation that is placed inside a depression of the surface of the muscle fiber. This structure is denominated as motor point or myoneural junction.

The motor points are the optimal areas for the stimulation of skeletal muscles. The threshold stimulus for a muscle will be lower in these points. These are usually located in the area where the nerve penetrates into the epimisium.

Once the muscle can be divided into motor units, this means the group of muscle fibers innervated by a unique nerve fiber, the trigger of a unique nerve fiber determines a contraction with a force proportional to the number of muscle fibers innervated by the motor unit. Thus, the number of motor units triggered and the size of each motor unit control the intensity of the muscle contraction.

The maps of the motor points presented in the ANNEX (figures 1, 2, 3 and 4), show their approximate locations, however a certain local exploration must be performed to know their individual location.

If there is no thorough knowledge of the motor points, it is recommended to apply the myo-energetic technique, which consists of the localization of two plate type electrodes on

each end of the muscular centre to be stimulated so that the current goes through the entire length of the muscle.

Generally, the changes produced in the muscle by electrostimulation are similar to those produced by voluntary contractions: there is an increase of the muscular metabolism, higher oxygenation, release of metabolites, dilation of arterioles and a consequent increase of blood irrigation into the muscle.

The electrically produced muscle contraction is metabolically more wearing and fatiguing than a muscular contraction generated by voluntary physiological activity. The electrostimulation provokes a synchronic contraction of a few motor units, while voluntary contraction mobilizes a higher population of active motor units, in low frequency and in a non-synchronized manner. Thus, one of the Pulse Trains is customized so that the appearance of muscle fatigue is delayed, since the muscle works in a contraction-relaxation cycle. The suggestion for the relationship between $\mathbf{T_{ON}}$ and $\mathbf{T_{OFF}}$ of the pulse trains is 1:2 for muscles with low trophism does not present early fatigue.

Another point that deserves to be highlighted is the different frequencies that are available in the **NEURODYN 10 channels.** In muscle strengthening programs by E.E., the selection of frequency is of vital importance because you cannot obtain tetanic muscle contraction with low frequencies such as 10 Hz and tetanic is a little higher than this value. As a result the total contraction force progressively increases with the increase of the stimulation frequency until reaching a maximum limit close to a frequency of 50 Hz. Even using frequencies higher than 50 Hz, an additional increase of the contraction force will not be produced. During the tetanic contraction, the muscular tension performed is nearly four times of the tension performed by the unique muscular shocks.

The frequency also interferes with the sensitivity threshold, because higher frequencies trigger lower perceptions, once they reduce the resistance capacity of the epidermis to the passage of current.

The effects of E.E. are:

- Promotion of muscular contraction: The E.E. can help to obtain a voluntary muscular contraction, inhibited by the pain or by a recent lesion.

- Reduction of muscular action: Prolonged sedentarism or the incorrect use of musculature may affect its functionality.

- Learning new muscular action: After tendon transplants or after reconstructive surgery, E.E. may aid in the reestablishment of a new muscular movement pattern.

- Hypertrophy and increase of muscular power: Its application in adequate intensities contributes in the hypertrophy process and in the increase of power in a weak muscle.

- Increase of blood irrigation: Muscular vasodilatation and sensory stimulation reflexes promoted by E.E. induce an improvement in the local blood irrigation.

- Increase of the venous-lymphatic return: E.E. favors the venous and lymphatic return by promoting successive contractions and muscular relaxation and acting on joint movements. This action is more effective if the stimulation is performed on the body areas to be treated in lymphatic drainage position, besides a compressive bandaging. - Prevention and elimination of adherences: Electrically generated muscular contractions aid in the prevention of

adherences after hemorrhage and also aid in eliminating musculotendinous adherences that are already formed.

GUIDELINES AND PRECAUTIONS FOR THE STRENGTHENING PROGRAM

- In the first sessions of an E.E. program, the intensity of the current must be increase little by little, as the E.E. is a new sensorial experience for most patients.

- For the muscular strengthening programs that need more than one channel, synchronous stimulation must be selected. In cases of functional re-education, it is already possible to select the sequential or alternate modes, positioning the electrodes in order to develop the movement of the entire muscular chain involved, thus intending to improve movement through the contraction of the different muscular groups.

- The active electrode must be positioned on the motor points of the muscle to be stimulated.

- In obesity, a large layer of fat can effectively isolate the nerve or the motor point to be reached by the surface electrode. The result will be an extremely high threshold to the stimulation, requiring a high intensity to achieve the desired effect.

- In the case of diabetics or other patients who have peripheral neuropathies, E.E. is not able to induce the desired muscular response.
- Avoid the use of E.E. on areas that have been subject to polarized current treatment, especially on the positive pole, since in the anode, the applied potential increases the potential of the membrane. This causes the membrane to become less permeable to sodium and results in an increased resistance to the stimulation using other means.
- Avoid the application of cold before E.E., as LEHMANN et al. (1994), related that cooling can affect the nerve conduction through the peripheral nerve, sensitive as well as motor, or as a transmission of the nervous impulses through the myoneural junction.

Lymphatic Drainage Program

The techniques of lymphatic drainage must be performed in sequential mode, with the electrodes positioned in the muscular centers (myoenergetic), nerve trunk (emergency of the nerve root) or motor point.

NOTIONS REGARDING THE LYMPHATIC SYSTEM

Morphology

The lymphatic system consists of:
1) a vascular system, constituted by a particular group of capillaries, collecting vessels and lymphatic trunks; 2) by lymph nodes which act as filters of the liquid collected by the vessels, and 3) by lymphoid organs which include tonsils, spleen and the thymus.

The lymphatic systems is in charge of collecting the interstitial liquid inside the tissues and reconduct it to the vascular blood system. When the interstitial liquid passes into the lymphatic capillaries, it receives the denomination of lymph. The lymph presents a composition similar to blood plasma: it mainly consists of water, electrolytes and variable amounts of plasmatic proteins that escape from the blood through blood capillaries. Lymph differs from blood mainly due to the absence of blood cells. The lymphatic vascular system has superficial and deep vessels. According to MACHADO (1970), the lymphatic sub facial collectors (deep) are less numerous than the superficial ones and more numerous than the blood vessels that these generally accompany. The deep vessels generally follow deep veins, which as a rule accompany arteries. The superficial vessels pass through the superficial fascia and the related lymph nodes are usually found where the large superficial veins are anastomosed with the deep veins.

The capillaries are presented with a blind end, this means they are closed and their ends are slightly dilated under the form of small bulbs, they are rarely found in most of the areas where the blood capillaries are located.

Consequently, the lymphatic system is a one way system, this means it only returns the interstitial liquid into the circulatory torrent and thus prevents the formation of edemas. The lymphatic capillaries are composed of a cylinder of endothelial cells that join the intercellular conjunctive tissue through the protective filaments. Meanwhile, there are no connections between the endothelial which form the wall of the capillary, these are superimposed into scales.

This arrangement forms a one-way functional valve. The pressure of the interstitial liquid outside the lymphatic capillaries, pushes the margins of the endothelial cells inside, allowing for the liquid to penetrate into the capillaries. Once inside the capillaries, this liquid cannot return to the spaces due to the pressure inside the capillaries which forces the ends of the endothelial cells to join, closing the valve. Due to this structural arrangement, the lymphatic capillaries are more permeable than the majority of blood capillaries.

The lymphatic vessels have a large repair capacity and a large capacity of forming new vessels after damage. The new vessels are initially formed as solid cellular sprouts produced by mitotic division of the endothelial cells of the vessels that remain, later the sprouts are channeled.

The lymphagion is characterized as a part of a pre-collecting vessel or a lymphatic collector, located between two valves, equipped with their own nerve termination and their own co-automatism (LEDUC, 2000).

The flow of lymph is relatively slow: approximately three liters of lymph penetrate into the cardiovascular system in 24 hours. This flow is slow because, opposite from the cardiovascular system, the lymphatic system does not have a central organ pump, consequently it depends on external forces to the body, such as gravity, passive movements, electrostimulation or massage, besides internal forces such as muscular contraction and pulsation of arteries close to the vessels, visceral peristaltism and respiratory movements.

The lymph absorbed in the lymphatic capillaries is transported into the pre-collecting and collecting vessels, it passes through several lymph nodes, here it is filtered and resent into the circulation until reaching the blood vessels. In the higher limbs, the superficial lymphatic vessels as well as the deep vessels reach the axillaries lymph nodes. In the lower limbs, the superficial and deep vessels flow into the inguinal lymph nodes.

Within the edema-lymphatic context, the E.E. is one of the resources of great aid to the professional. The basic objective of the E.E. is to drain the excess fluid accumulated in the interstitial spaces in order to maintain the equilibrium of the tissular and hydrostatic pressures.

In case of fibro-edema geloid esthetic pathology (erroneously denominated cellulite), there are symptoms of difficulty for the venous and lymphatic return, caused by the increase of pressure of the fundamental amorphous substance, polymerized on the vessels. Consequently, the E.E. in a fibro-edema geloid will be of great value under two aspects: increase of the blood and lymphatic return and muscular strengthening of the area in question, aiding in the treatment of this condition.

GUIDELINES AND PRECAUTIONS FOR E.E. DRAINAGE

- The best results are obtained through the association of the E.E. with the positioning of the elevated area of the body in question (drainage position).
- The direction of the stimulation must always be from distal to proximal, producing lymphatic and venous circulation flow.
- Another resource that may be associated to the sequential mode is compressive bandaging, its intensity of compression is higher in the distal area of the section to be treated. In this case the electrodes are fixed under the bandage;
- Conversely to the muscular strengthening program, here the electrodes must be positioned in such a manner that they do not contract specific muscles, but muscular groups that perform the function of a pump, preferentially in the distal to proximal direction.
- It is recommended for the electrodes to be positioned in the trajectory of the nerve that is related to the muscles to be stimulated. Due to the existence of 8 channels, 4 channels can be used in each section;
- The electrostimulation in FEG, besides aiding in the drainage of the target area, it exerts a valuable action on the muscular hypotony, which with rare exceptions is not associated to the FEG.

AUSSIE CURRENT (AUSTRALIAN CURRENT) -

In recent years, the use of electrical currents for the treatment of different tissue dysfunctions and their symptoms has greatly increased.
The inflammatory symptoms can be controlled and reduced, the pain can be modulated until the cause of localized pain is eliminated, tissue repair can be achieved quickly and muscle function can be recovered. Reports of the use of excitomotor currents in professional athletes included side effects and the improvement of **performance** as well as neurophysiological alterations, morphological and biochemical reported by researchers.
Commercially the currents, RUSSIAN, Interferential and FES **(Functional Electrical Stimulation)** are classic, however so far, there has been no real concern regarding the development and production of new treatment options using electrical currents that provide a comfortable sensory stimulation without compromising the electrophysiological efficiency as well as a powerful motor stimulation without the pain threshold being reached and thus, the development of neuromuscular electrical training limited in function by the presence of pain.
Recently, studies suggests that modulated alternating electrical currents in Bursts of long duration produced by traditional currents such as Russian and Interferential are not the best currents to minimize discomfort during sensorial electrostimulation and produce high levels of muscle torque during motor stimulations. The frequency of 4,000 Hz or 4 kHz for modulated alternating currents in Bursts of short durations offers less discomfort during sensorial stimulation. Interferential therapy uses this value of carrier current; therefore its modulation in Bursts is very long.

Aussie current or **Australian current** has a capacity of performing a sensorial stimulation with minimum discomfort because it is also a medium frequency current (4,000 Hz or 4 kHz) and also in function of the use of modulation in Burst of short duration, thus becoming even more comfortable when compared to interferential therapy and Russian current.
Studies also suggest that for intense and efficient motor stimulation and for minimum discomfort, a frequency of 1,000 Hz or 1 kHz should be used combined with a modulation in Bursts with a duration of 2 ms. This is **Aussie current** or **Australian current** for functional recovery of skeletal muscle. Comparative studies suggest higher production of torque for Aussie Current or Australian current when compared with RUSSIAN stimulations and performed through FES.
The explanation why the modulation in Bursts of short duration in medium frequency alternating currents provide higher efficiency for sensorial as well as motor stimulation, this is based on the principle proposed by Gildemeister, also known as 'Gildemeister effect'. In the 40s, Gildemeister reported that when Bursts of alternating current are used for stimulation, the nervous fiber trigger threshold decrease in a directly proportional manner to the increase of duration of the Bursts.
Gildemeister explained that this occurs in function of a phenomenon known as the summation of sub-threshold depolarization. In this phenomenon, in each pulse of modulated alternating current in Bursts, the nervous fiber is partially depolarized and approaches the

threshold of depolarization will only occur after a sufficient number of pulses. Thus, if the duration of Bursts were too long, a low intensity stimulus will be necessary, requiring the occurrence of a higher summation in order that the threshold can be reached. However, Gildemeister suggests that there is a value of maximum duration of pulses in which the summation can occur and Gildemeister called this the nervous fiber utilization time phenomenon.

Recent research suggests that the time of use is higher for smaller nervous fibers. Nervous fibers of large diameter such as motor neurons Alpha (motor) and A beta (sensorial) present short utilization periods and the summation phenomenon occurs rapidly, while small diameters A Delta and C (pain) present much slower summation periods. This explains the fact that Australian Current is more comfortable for clinical use when compared with other currents such as Russian, Interferential Therapy and FES.

Thus, **Bursts** of short duration of medium frequency alternating current is used, nervous fibers of smaller diameters do not have time to complete the summation phenomenon, and however the fibers of larger diameter do have time. In this manner, there will be less nociceptive fiber activation in detriment to a higher activation of the sensorial fibers with the use of Aussie Current (Australian current). However, this also explains the fact that it is possible to achieve a more comfortable motor stimulation through Aussie Current (Australian current). The Alfa motor neurons are preferentially attracted by Aussie Current (Australian current) in detriment to A delta fibers and C fibers. Thus, if alternating currents with frequency in kHz are modulated in **Bursts** of long duration, there will be a higher activation of nociceptive nervous fibers. It is traditionally known that Russian current and Interferential current work with **Bursts** of long duration, the opposite does not occur with Aussie Current (Australian current), making it more comfortable in relation to the first.

Resistance to Fatigue – Resistance to muscle fatigue is an extremely important factor within the rehabilitation procedures including recovery of skeletal muscles, particularly when an excitomotor current is used (FES, Russian, Interferential). For FES, it is important to minimize muscle fatigue. The summation may become a problem when using medium frequency alternating currents, especially if the modulation in **Burst** is for long periods. In this case, the nervous fibers can undergo summation and reach the threshold and after that, undergo repolarization and depolarization again during the same **Burst**. Thus, the summation can result in depolarization of the neural fiber at the start of the **Burst** and therefore, the nervous fiber cannot recover sufficiently and be triggered again. If the **Bursts** have long duration, there will be a high potential for the nervous fiber to undergo several triggers within the same **Burst**. Therefore, if the **Bursts** are too long as it occurs in Interferential Therapy and Russian current, there is a high risk of several triggers occurring or depolarization of Alfa motor neurons within a same **Burst**. It is therefore suggested that modulation frequencies in **Bursts** of 40Hz be used. Higher values can lead to premature muscle fatigue.

The use of Aussie Current (Australian current) for motor stimulation allows for higher levels of muscle torque and even lower occurrence of muscle fatigue. The duration of the **Bursts** is kept short in order to avoid multiple triggers of the Alfa motor neurons.

Current Density – When a medium frequency current (kHz) is used as a stimulus, there is the risk of irritations or other cutaneous complications if the density of the average current is raised. When we talk about pulsed currents such as T.E.N.S. and FES, the risk is lower because the pulses are short and separated by smaller time intervals, therefore the average electrical current used during the treatment is lower. When Interferential current in its quadripolar form is used, the transcutaneous electrodes transmit the pulses in a constant manner, thus as the average density of the electrical current becomes higher, there is a certain risk of cutaneous irritation.

This risk can be minimized through the use of larger electrodes, which automatically causes the reduction in local current density. The current density is measured in mA per centimeter of area, therefore, if the area automatically increases, the current density is reduced.

Aussie Current (Australian current) is made up by **Bursts** of short duration, separated by long time intervals and in this manner, the risk of cutaneous irritations is low, the electrical current density is reduced. In any case, larger electrodes are ideal in terms of providing less discomfort by reducing the electrical current density and lowering nociceptive stimulation.

What is **Aussie Current (Australian Current)** really?

Aussie current (Australian current) is alternating therapeutic electrical current with frequencies in the range of kHz with some similarity to Interferential therapy and Russian current. The difference is in the value of the current in kHz used as well as in the shape of the wave. Traditionally, Interferential Therapy is modulated with amplitude in sinusoidal shape (figure 1ª) and Russian current is formed by **Bursts** with 50% of the working cycle (time 'on' and 'off' – figure 1b).

The aussie current (Australian current)
presents short pulse duration (figure 1c) and it is exactly this fact that makes the stimulation provided by Aussie Current (Australian current) more efficient compared with other electrical current therapies.

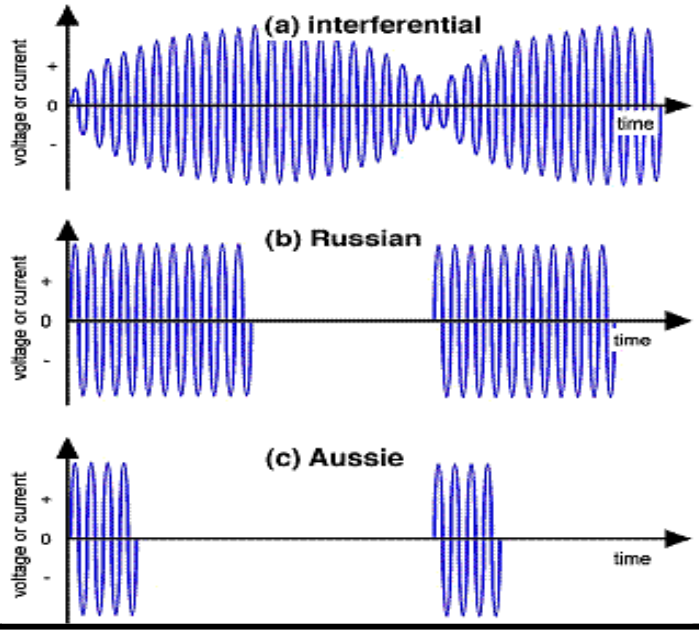


Figure 1 – Wave shape of the stimuli provided by (a) Interferential Current, (b) Russian Current and (c) Aussie Current (Australian current), illustrating the different durations of the **Bursts**.

Clinically, it is well accepted that Interferential Current is very comfortable and able to be well tolerated by the patients. Russian Current is also accepted as a comfortable current and able to produce powerful muscle contractions, therefore it can be used to reduce muscle atrophy by disuse and general muscle strengthening. Interferential Current as well as Russian Current is accepted as being more efficient when compared with pulsed currents of low frequency (T.E.N.S. and FES). Today, the T.E.N.S. or Interferential Current are the selected therapeutic methods for the modulation of pain, while in general, Russian Current is the option when the objective is the functional recovery of skeletal muscles. So far, there is little scientific evidence against these options or choices of treatments involving the use of electrical current therapies. The scientific research conducted throughout the years, especially over the past two decades, has compared Interferential Current, Russian Current and Pulsed Current such as T.E.N.S. with stimulation in terms of comfort, muscle contraction strength and efficiency in analgesic procedures.

The results suggest that all the currents present their advantages and disadvantages, however none of them should be considered optimal for the proposed treatments. Strong scientific evidence suggests that alternating current of frequencies in the range of kHz, modulation in **Bursts** of short duration, this means, Aussie Current (Australian current) is more comfortable and efficient in the production of muscle and analgesic torque.

Short duration pulses of Aussie Current (Australian current) provide stimulation that:

Is more efficient than FES, Interferential Current and Russian Current stimulating muscle contraction;

-Is as efficient as the T.E.N.S. and Interferential Current for the control and modulation of pain.

Stimulation history through alternating currents

In 1894 D'Arsonval was the first to report the effects of transcutaneous stimulation through alternating electrical currents on the human body. The researchers used alternating currents variable frequency ranges of 1kHz to 5kHz and observed that the tetany was reached between the frequencies 10 to 15 Hz, that neuromuscular excitement became intense with frequencies between 1,250 – 1,500 Hz, constant with frequencies between 1,500 and 2,500 Hz and finally decreased with frequency values of 5,000 Hz (higher value than your device can generate). D'Arsonval also noted that current with a frequency of 1,500Hz was more uncomfortable when compared with current with a frequency value equal to 5,000Hz, however, the same frequency of 1500 Hz was more comfortable when compared with a current of 1,000 Hz. Therefore, their studies brought us the theoretical and scientific basis so

that the use of alternating current with frequency in kHz could be used in daily clinical practices. His conclusion was that alternating currents in the range of kHz could produce a higher stimulation level with less discomfort with the adequate selection of current frequency in kHz.

In the 50s, Nemec proposed the therapeutic use of Interferential Current. The basis used by Nemec was abandoned by D'Arsonval. However, at that time, it seemed that the greatest interest of the scholars was concentrated on comfortable sensorial stimulation with little concern related to skeletal muscle activation and recruitment, because for this, lower frequencies such as 1.5 kHz to 2.5 kHz are necessary.

For the creation of Interferential current, Nemec argued that if two alternating currents in the range of kHz frequencies with little different between their carriers were applied using two pairs of electrodes , these will undergo interference in the tissue, producing a maximum stimulation in the intersection region of the two pairs of electrodes, the result of this is a higher stimulation depth and the presence of an amplitude modulation with a pulse frequency equal to the different between the values of the two currents provided in the range of kHz.

The pre-modulated Interferential Current is an electrical therapeutic current which is already modulated and therefore, can be used with only a pair of electrodes.

In the 70s, Kots suggested the use of an alternating current with frequency in the range of 2.5 kHz for the first time, applied in rectangular **Bursts** of 10ms with frequency of 50 Hz. Kots reported, that with the use of electrical current, the strength gain was higher than 40% in elite Russian athletes. The suggested protocol presented 'on' period of 10 seconds and 'off' period equal to 50 seconds during period of 10 minutes. However, at that time, it seemed that the greatest interest of the scholars was concentrated on comfortable sensorial stimulation with little concern related to skeletal muscle activation and recruitment, because for this, lower frequencies such as 1.5 kHz to 2.5 kHz are necessary. Kots and his colleagues compared constant alternate current of 10 ms, 50 Hz of **Bursts** with frequency varying between 100 Hz to 5 kHz and reported a maximum production of torque at 1 kHz when the electrodes were positioned above the nervous trunk and 2.5 kHz when the electrodes were position on the stomach muscle. Kots findings also suggest that despite their small size, there is a higher production of torque with **Bursts** of alternating current when compared with other forms of alternating current. Therefore, stimulation with **Bursts** of 10 ms is more efficient in comparison to stimulation through constant alternating current. At the time the researchers did not compare the current with other currents with **Bursts** of short duration.

As shown in figure 1, interferential current presents a modulation in **Bursts** of long duration. Already the Russian current presents less duration of its **Bursts** when compared to interferential therapy and finally, Aussie Current (Australian current), within the world of alternating currents with the frequency range in kHz is the current that presents **Bursts** with the shortest duration. In the 80s, a Russian scientist called Bankov, compared in a study performed by himself that, pre-modulated interferential current with **Bursts** of alternating current with a period of rest between themselves. The researcher found that, modulation in **Bursts** with a period of rest between themselves was more comfortable during the production

of muscle contraction. Regarding the wave shape of the **Bursts**, the researcher also suggested that the rectangular shape of the **Bursts** would be more comfortable when compared with **Bursts** of sinusoidal shape.

Recent evidence on Aussie Current (Australian current)

More recently, Ward et al.(2004) measured the production of torque as well as the discomfort produced by alternating currents with frequency in kHz (500 Hz to 20 kHz). The authors also compared changes in **Bursts** to individual pulse cycles of alternating current (biphasic pulsed current) with **Bursts** of maximum duration (constant alternating current). The authors found that, for the production of maximum torque, the pulse frequency of 1 kHz and duration of **Bursts** of 2-2.5 ms was the best. The results are shown in figure 2.

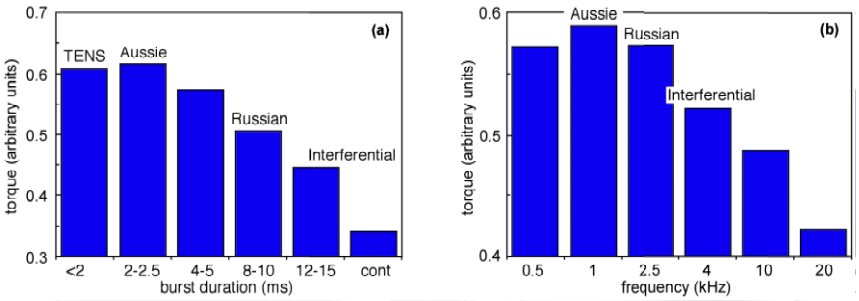


Figure 2 – (a) duration of **Bursts** and (b) ideal frequency for the production of torque. The current used in the experiment was T.E.N.S., Australian current (AUSSIE), Russian current and Interferential current. Aussie current (Australian current) was the most efficient.

Therefore, Aussie Current (Australian current) used a frequency of 1 kHz combined with **Bursts** of duration equal to 2ms. Consequently, the production of torque is maximum. Gradient modulation must be used with the objective of avoided early muscle fatigue.

Ward et al. (2007) also found after some research that, for minimum discomfort, a frequency of 4 kHz with 4-5 ms duration of **Bursts** are the best parameters. Figure 3 shows the number of complaints of discomfort during the stimulation. It is important to note that the discomfort depends essentially on the duration of **Bursts** and current frequency.

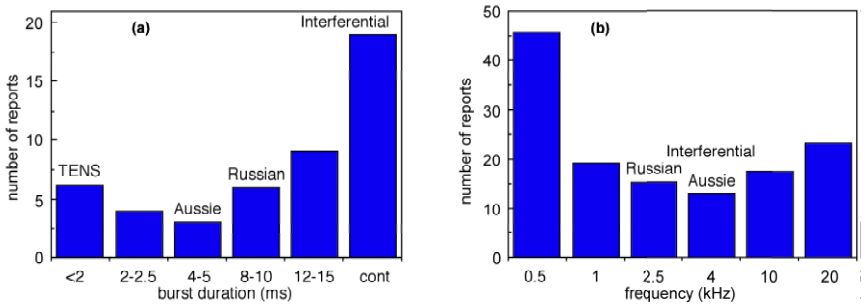


Figure 3 – (a) duration of **Bursts** and (b) ideal frequency for comfortable stimulation. The current used in the experiment was T.E.N.S., Australian current (Aussie current), Russian current and Interferential current. Australian current was the most efficient.

Therefore, it can be noted that Aussie Current (Australian current) should be used when the therapeutic objective was sensorial stimulation and in this case, the modulation of pain can be achieved as well as obtain efficient motor stimulation through activation of the motor neurons. For sensorial stimulation, a frequency of 4 kHz and modulation in **Bursts** with duration of 4 ms should be used. Already for motor stimulation, a frequency of 1 kHz and modulation in **Bursts** with duration of 2 ms should be selected.

It is important to note that the frequency used for interferential therapy (4 kHz) is also used for sensorial stimulation with the main objective to decrease discomfort during stimulation. However, the efficiency in this type of stimulation is not maximum due to the long duration of modulation in **Bursts**.

Regarding stimulation through Russian current, we must also be critical in perceiving that alternating current with frequencies in the range of kHz does not provide the optimum frequency for motor stimulation.

Additionally, Russian current provides modulation in **Bursts** of very long duration, which makes it inefficient for the production of maximum torque and still relatively uncomfortable regarding sensorial stimulation.

The two manners in which Aussie Current (Australian current) is used are extremely efficient and faithful to what they propose.

For the production of maximum torque using Australian current with a frequency of 1 kHz and modulation in **Bursts** with duration of 2 ms must be used. For sensorial stimulation with minimum discomfort, and consequently, higher acceptance by the patient, Aussie current (Australian current) must be used with a frequency of 4 kHz with modulation in **Bursts** of duration equal to 4 ms.

Australian Current for pain modulation

Traditionally, the therapeutic modulation selected for pain modulation work is T.E.N.S. with pulse frequency that can vary between 10 to 180 Hz, traditionally a frequency of 100 Hz and short pulse duration of a maximum value between 100 and 150 µs is selected. Interferential current of 4,000 Hz can also be selected as a treatment option. A study by Shanahan et al. (2006) compares the hypoalgesic effect of interferential current with pulse current of low frequency (T.E.N.S.). According to the obtained results, the two currents used provide positive effects, however interferential current seems to be more comfortable when compares with T.E.N.S.

A more recent study by McCarthy (2007) compares Aussie Current (Australian current) with pulsed current and found that the first was more comfortable and also more efficient. A small duration of the **Bursts** of Aussie Current (Australian current) results in a higher efficiency during the analgesic procedure without compromising the more agreeable sensation during the therapy.

A similar study performed by Ward and Oliver (2007), compares low frequency pulsed current with Australian Current for analgesia and once again observed higher efficiency with less discomfort when using Australian Current compared to that of T.E.N.S (figure 4b).

Thus, the evidence suggests that when an alternating current with frequency in the range of kHz, modulated in **Bursts** of short duration is used, the analgesic effect is better when compared with T.E.N.S. Stimulation is more comfortable and the tolerance level of the patient increases greatly, which makes treatment more efficient.

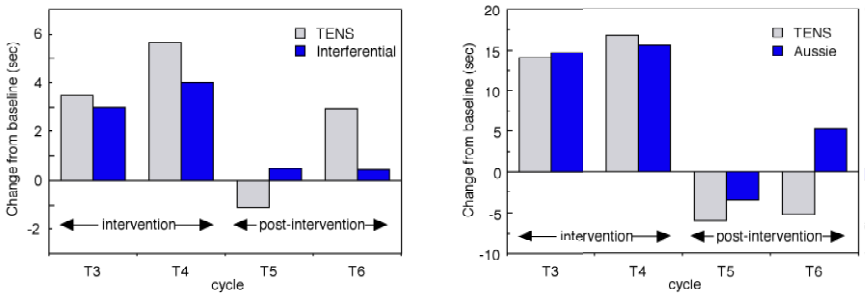


Figure 4 – Change in time of pain tolerance (time in which the volunteer can keep their hand immersed in cold water). Cycles T1 and T2 indicate the pre-intervention period. Cycles T3 and T4 indicate the duration of the intervention and T5 and T6 indicate the period immediately after the intervention.

In relation to what has been presented in the abovementioned paragraphs, we can note that Aussie Current (Australian current) is a physical therapy that has come to add value to the clinical care provided to patients who require physical rehabilitation in different areas of specialized physiotherapy. It is important to emphasize that dozens of scientific publications support the unquestionable efficiency of use of Aussie Current (Australian current), which was not the case during the verification of other electrotherapeutic resources throughout the years. All the physical values attributed to Aussie Current (Australian current) for muscle strengthening as well as sensorial stimulation has a wide scientific basis besides its values and thus, for this therapeutic method, the practice based on evidence is an incontestable reality.

Electrolipolysis

The electrolipolysis is a therapeutic technique not commonly used in the universe of the esthetic medicine. The cause of this is the reduced quantity of scientific works in the literature. Controlled placebo studies are rare, thus, the quantification of the true effects of the technique of use are still unknown. However, a significant quantity of dermatofunctional physiotherapists and other professionals of the esthetic medicine area involved in the daily practice of assistance report animating results after the use of the technique in the following conditions:

- localized fat treatment;

-.Lipodema (cellulite);
- post-liposuction nodules and retractions;
- muscular sagging (abdominal, glutes and face);
- minor skin flaccidity;

The electrolipolysis technique is characterized by the application of non specific alternate electric current, but of low frequency (5Hz) which will act directly adiposity cells of specific regions
of the human body. The technique provides de lyses of the adipocyte cells and later helps in removal of the cellular wastes.

The use of this therapeutic technique, which electrodes are very thin needles (figure 1), creates an local electrical field with the passing of the current generated by the equipment. It is an invasive technique and thus, the care related to the sterilization as well as to the operational care with the needles and the equipment itself, should be considered in order to avoid serious problems to the patients.

The action mechanisms present during the use of the technique are related to the circulatory increase produced by passing of the electric current. This would be responsible for drainage of the treatment area. An important action of the technique is assigned in the stimulation of free nervous terminations of the sympathetic branch of the autonomic nervous system which results in release of catecholamine (adrenaline and noradrenaline) which, in turn, have direct action on the receivers of the adipocyte cells, stimulating a specific enzyme that potentialize the lipolise in the stimulation location.

The electrolipolysis technique provides the following physiologic effects:

-Production of local heat: When passing of an electric current by means of a conductor, the production of local heat occurs by the response of the ions, dipoles and other molecules present in the corporal tissues. The increase of vascular dilatation occurs in the location of stimulation as well as an increase of the blood flow and consequently an increase of the metabolism. In addition of the lipolise, an improvement of the cellular trophism is felt due to the stimulation of the web of the subcutaneous collagen tissue.

-Anti-inflammatory action:. Occurs due to the reabsorption of metabolites that influence in a direct manner in the edematous reaction. The effect of the electric current used modifies the permeability and the polarizations of the cellular membrane, electrolytic effect, see below. A change in the ionic concentration of Na^+ and K^+ occurs as well as a change in the content of the intracellular water.

-Electrolytic effect: With the use of the technique the induction of the ionic move occurs and consequently changes in the polarity of the cellular membrane with consumption of energy by the cells.

-Change in the circulatory flow: The production of local heat induces the increase of circulatory flow. A vasodilatation occurs due to the current stimulation on the nerves (**vasa vasorum)** which allows opening of the capillary o **shuts** and consequently the vasodilatation. The electric current present in the local microcirculation increases the circulatory debit,

facilitates the cellular catabolism thus eliminating the toxins and fat degradation products. Low frequencies of current can also induce to the improvement of the lymphatic flow which influences directly in the therapeutic effects of the cellulite treatment of different degrees.

-Neuro-hormonal effect: Due to the low frequency of the current used during the electropolise procedure, the stimulation of the sympathetic nervous system occurs and consequently the release of important hormones such as adrenaline and noradrenaline can be observed. An increase in the intradipocytary AMP occurs and consequently the lysis of triglycerides.

The use of the electrolipolysis technique is not recommended for patients with heart or kidney failures, patients using demand heart pacemakers, patients with deep venous thrombosis diagnostic, epileptic patients and pregnant patients or users of anti-coagulant medication. For patients using DIU or metallic prosthesis the non recommendation is relative, and the positioning of the needles next to these structures should be avoided.

Effects of stimulation by means of therapeutic needles

When the use of needles is selected instead of the carbon or aluminum silicone electrodes for tissue-type stimulation procedures, there is a high concentration of electric charges in the fixing points of the needles. This occurs due to the small area of the electrodes, in this case, represented by the needle tips. Thus, in this condition, the electric field and consequently the offered power, is not distributed and passes to be concentrated in specific points. This is what the literature describes as the “power of the tips”. This procedure within the electrolipolysis is very advantageous due to the actual need of power concentration to that the therapeutic objectives already described can be achieved. The production of local heat as well as the increase of the tissue-type circulation should occur.

Particularities of the Electrolipolysis

The therapeutic technique of the electrolipolysis may result in analgesic effects due to the stimulation of the A Beta and A Delta fibers. For this to occur, the equipment should provide the activation of specific frequency ranges. Stimulation low frequencies, 5Hz to 30Hz, offer higher efficiency in activation of A Delta fibers, while higher stimulation frequencies 120Hz to 170Hz, activate in an more efficient manner the A Beta fibers. In the first case we have analgesia of longer duration, approximately 2 hours and in the second case, duration of the analgesic effect is short, limited to the time in which a flow of current exists between the electrodes or needles, pre-synaptic inhibition.

Thus, in case patients, the fact of the needles being introduced to that the stimulation can occur may not mean a lot in terms of pain or discomfort.

Implementation technique of needles and therapeutic details

After studying the main theoretic concepts related to the electro lipolysis, we will see step by step how the procedures related to the selection and implementation of needles should be applied.

As this is an invasive procedure, some advance cares are necessary, such as the use of gloves by the professional, individual needles and which if possible should be discarded after their use. Thus, a waste bin should be present in the attendance room so that the posterior risks of accident may occur during the remover of the material for final disposition.

Before start of treatment procedures, the professional should observe if the patient or client has any type of cutaneous change in the region to be treated that may hinder the use of the technique such as: Wounds, eczemas, acne, inflammations, a type of active tumor. The quality of tissue hydration should be observed, using as indicator the quantity of sodium (30 to 90 mEq/L would be the interval of values within what is considered as normal).

Positioning of patient is very important for the success of the technique in terms of therapeutic results as well as in relation to the patient safety during treatment. Never place the patient in a way that there may be risk related to the possibility of part of the patient's body fall on the fixed needles. This may result in serious perforations in other tissues and also in the entrails depending on the region of the body that is under treatment.

Needle introduction should be made respecting an approximate angle of 90º between the needle and the patient skin, by the alligator fixing, a partial loss of the 90º angle (figure 1).

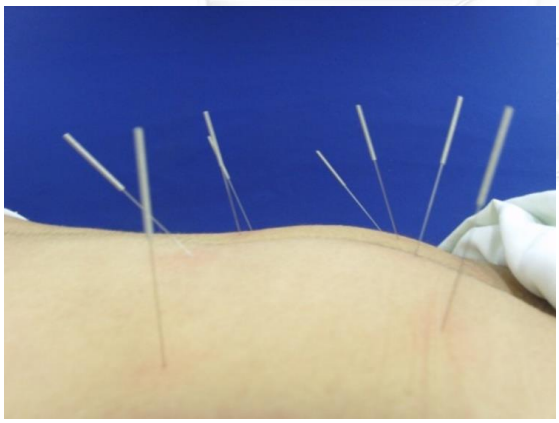


Figure 1 - fixing the needle in the skin

To avoid accidents such as burns or discomfort to the patient, his/her skin should be isolated from the other areas of the needle and also from the alligator through placing of completely dry gauze between the skin and the needle and the alligator (figure 2). The alligator can be fixed to the skin by means of small pieces of sticking plaster or **micropore** tape so that moves in the needle fixing location in the skin can be avoided generating minor discomfort to the patient during the treatment sequence (figure 3).

Figure 2 –Slight inclination of the needle due to the weight of the alligator clip, partial loss of the 90º angle.

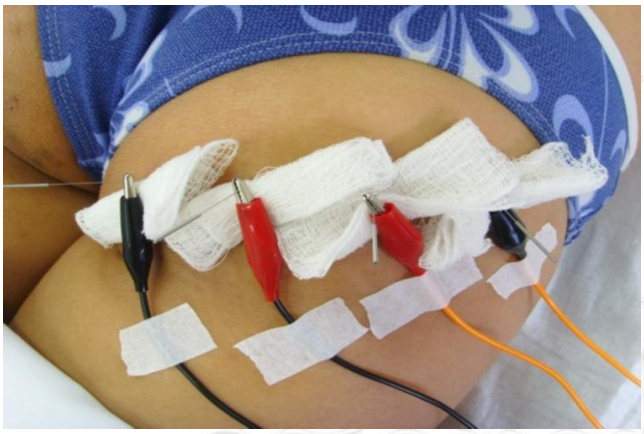


Figure 3 – Placement of gauze between the needle and the alligator and fixation of the cables with tape to prevent movement in alligator and consequently the needle.

The region of the skin corresponding to the treatment location through application of the electrolipolysis technique should be clean and if possible free of hairs.

For the procedure, the professional of the esthetic medicine area should opt for the use of acupuncture needles as these are disposable and their introduction in the desired tissue is easy. The needles should be placed always respecting a distance of 5 cm between each other and 1cm to 2 cm between two pairs. For the treatment, more than one channel of the equipment can be used depending on the size of the area to be treated.

For fixing, hold the needle at approximately 4 cm from it tip between the claw of the thumb and indicator exercising strong pressure on the needle for higher safety during the procedure. With the other hand, the professional should stretch the skin in the region of the body that will receive the needle in order to facilitate the fixing procedure of the needle with minor risk of discomfort. Needles with diameters above 0,30mm present greater fixing facility in the sub-hypodermic tissue.

If the professional prefers, the use of guiding tubes for needle fixing is possible. Thus, for this procedure, the guiding tube should be pressed on the skin in the region to be treated. If possible, the skin should be stretched prior to positioning of the tube in order to facilitate penetration of the needle. The upper part of the needle receives a rapid and dry blow with the indicator in direction to the skin. Needle penetration in this condition will not be superior to 1cm. After the initial penetration, the professional should incline the needle and push it in direction to the sub-cutaneous tissue looking for an adipose tissue. It is herein suggested that for this procedure the needle is to be positioned parallel to the skin. With one of the hands the therapist pushes the needle and with the other he stabilizes the skin next to the fixing point forming a fold in the patient's tissue.

There is no consensus in the literature covering the duration time of the therapy related to the electrolipolysis therapy, thus, it is suggested the maximum time of 45 minutes of stimulation for each region of the body. After the use of the electrolipolysis technique, the professional should apply as complement another modality of therapeutic technique such as N.M.E.S., lymphatic drainage, corporal massage modalities or even some type of cosmetic. As related to the intensity, an agreement should be in force between the patient and the professional so that the offered stimulation can exceed the value of 10mA. However, it is important to highlight that the professional should respect the patient's nociceptive threshold. If the accommodation of the stimulation used occurs during the period of treatment, the intensity should be increased so as to find a new sensitive threshold for the stimulation. As related to the treatment frequency, maximum of 1 weekly session for the same location is recommended. If a change in treatment location exists, more than one weekly session can take place. The results with the use of the technique are not immediate whereas the first changes will not appear before the third week of treatment.

Use of the technique may imply in some secondary slight effects such as haematomas in the needle penetration points, erythemas immediately after the use of the technique, superficial necrotic point, pain at time of needle fixing, slight bleeding after removal of the needles.

It is important to highlight that unfortunately no scientific material is available in large quantity covering the electrolipolysis technique. Thus, large part of the material produced and made available mainly in books of the esthetic medicine segment, presents its concepts based on clinical experiences occurred during the daily practice with the patients.

RUSSIAN CURRENT

Prior to the 70 decade electrical stimulation was used predominantly in the recovery of the skeletal muscle of patients with neurological disorders. Already in the 70 decade stimulation of skeletal muscle began to be used to improve performance related to increased muscle strength in both healthy subjects and athletes and in patients with significant functional loss of the muscular system.

The current mode is a RUSSIAN electrotherapeutic often used in rehabilitation schemes in different areas of physiotherapy in order to retrieve and / or enhance the function of skeletal muscle. This feature was introduced in therapeutic means in the 70s by Russian scientist Yakov Kots, which

was also responsible for the first experiments involving the use of the RUSSIAN. However, the material produced by Kots has its disclosure restricted mainly due to the difficulties of understanding the Russian language since the information was not translated into other languages such as English. Thus, this material is intended to point information from the scientific literature to support the use of current Russian from the findings of original experiments performed by the group of Yakov Kots and translated into other languages less restricted access.

Indications for use of current RUSSIAN

- Strengthening of skeletal muscle significantly improved both motor control and muscle cell morphology by increasing the cross-sectional area of skeletal muscle fibers.

Unique features of the current RUSSIAN

- AC- Frequency of 2.5kHz
- Burst modulation at 50 Hz
- Duty cycle of 50%arrangements for supply of pulses 10/50/10 - 10/2 "on" 50 seconds "off '" for a period of 10 minutes per session.

Technique for placement of electrodes

Motor point, can be located by means of an electric stimulation of excitatory parameters (T and F) supplied to the muscle of the patient, is the point on the skin surface in which the motor branch of the nerve enters the muscle. This point is considered the least resistance to passage of electric current allowing the muscle increased arousal.

Muscle belly, localized the muscle belly visually prompting from the patient, for example, an isometric contraction is that the central region and higher perceived volume corresponds to the muscle belly that is desired to stimulate by means of current Russian.

Contraindications to the use of feature

-Patients with muscle pain of unknown etiology.
-Patients with acute muscle injuries.
-Patients with muscular dystrophy regardless of type.
-Patients with cognitive important and unable to provide feedback current intensity during the treatment prescribed.
-Patients with severe cardiac conduction.

Selkowitz (1989) reviewed experimental evidence suggesting the effectiveness of the current use of Russian in increased muscle strength. The author concluded that there was overwhelming evidence to show an increase in muscle strength after training with the current Russian, however, it is important to note that according to the author, the increase in muscular strength achieved through training with the current was not greater than the increase produced by training exercises through

volunteers or a combination of both techniques, voluntary exercise more Russian electrical stimulation.

Some therapeutic situations preclude the use of kinesiotherapy through resistance exercise. Thus, a therapeutic strategy to be used would be the use of muscle contraction induced by stimulation Russian. Patients in post-surgical lions musculoskeletal system, central and peripheral neurological lesions after cosmetic surgeries like liposuction are possible candidates undergoing training sessions through the current Russian.

Delitto et al. (1989) compared the strength gain muscle produced by electrical stimulation through the current Russian with the gain produced by voluntary exercise in patients undergoing reconstructive surgery of the anterior cruciate ligament. According to the authors, the group undergoing training by the current Russian showed greater gains in muscle strength when compared with trained volunteer.

Snyder-Mackler et al. (1989) compared the peak torque electrically induced by three different chains: Russian interferential to 4kHz and a biphasic current pulse, low-frequency. The greater torque produced was attributed to the Russian power, but the difference was not statistically significant when compared to low frequency current. Have Ward & Robertson (1998) compared the maximum torques generated by currents electrically modulated with 50Hz frequency bands ranging from 1 to 15kHz. The maximum torque generated was obtained when the frequency of 1 kHz was used in this experiment is that the authors did not use monophasic pulsed currents and low frequency for comparison. The limitation of the study occurred when there were direct comparisons with the current Russian.

Laufer et al. (2001) compared the maximum torques generated by using the electrically Russian a monophasic pulse current at 50 Hz and a pulse current biphasic also 50Hz. The only difference was pointed out by the authors between the Russian and biphasic pulsed current and the torque generated by the first better than that achieved by stimulation Russian.

Other scientific studies Snyder-Mackler et al. (1994, 1995) confirm the findings of Delitto et al. (1988), and also establish positive correlations between high intensity training and the percentage of improvement in muscle strength.

In relation to the intensity of stimulation given in milliamperes (mA), this should preferably be increased every 3 to 5 minutes within the same training session for the muscular adaptations occur and consequently also occurs an increase in muscle strength after training with current Russian.

The popularity of the current Russian

Dr. Yakov Kots in 1977 at a conference, said having achieved a 40% increase in maximal voluntary isometric muscle strength of elite athletes. This was not documented in written form and in function that some doubts still remain about the topic.

A Canadian group (St Pierre et al. In 1986) along with Yakov Kots conducted a study with college athletes. In this study, it was verified the presence of any previous reference produced by Kots, but the British Library had at the time of the study, a manuscript published in Russian by the scientist. The first experiments that led to the current Russian are reported below.

The parameters used were ac current with a frequency of 2.5 kHz in bursts modulated with a frequency of 50 Hz and a duty cycle of 50%. The arrangements for supply of pulses was 10/50/10, or 10 seconds - "on" 50 seconds "off '" for a period of 10 minutes per session.

The regime "10/50/10" was obtained by Kots from a study in which the authors used a pulsed current of T = 1 msec, rectangular waveform and frequency 50 Hz, and the second step of the experiments was to determine whether sessions would be made daily or every other day for 9 or 19 days of treatment. For this, the authors used for the experiments 37 young athletes aged 15 to 17 divided into four groups. Three groups received electrical stimulation in brachial biceps and group 4 received the current in the triceps surae. The maximum torque generated by the current was measured by load cell during voluntary isometric contraction (MVIC). The level of muscle contraction was also measured using a device developed for this purpose only in the groups that received electrical stimulation in brachial biceps.

In the first part of his experiments, Kots & Xvilon applied pulse trains at 50 Hz for a duration of 15 seconds and evoked muscle torque was monitored.

After this, the authors compare times greater stimulation time of 10 seconds and observed no reduction in the torque generated. However, the authors reported the occurrence of fatigue electrically induced, due to the use of current at the time of 12.5 seconds. Based on these observations, the authors concluded that a 10 seconds time would be appropriate for stimulation of the muscle fatigue that would be avoided.

As for the envelope, the determination of the time "on" had been made by the authors (Kots & Xvilon), so the time "off" should be determined for that muscle fatigue was avoided between each pulse tren offered during the treatments. The authors defined muscle fatigue as a visible decrease in muscle torque between two consecutive pulse trains of 10 seconds each. Were compared by the authors the following days "off": 10, 20, 30, 40 and 50 seconds. It was reported after experiments that time "off" less than or equal to 30 seconds reduced the average torque generated by the muscle in the second pulse tren.

Kots & Xvilon concluded that the time "off" should be between 40 and 50 seconds. From there the authors measured the variation of torque for 10 consecutive trains of pulses of 10 seconds each time and found that the "off" 40 seconds favored the occurrence of muscle fatigue especially in the last trains of stimulation. When used over time "off" equal to 50 seconds, muscle fatigue has not appeared during the 10 consecutive trains of pulses of 10 seconds each.

Thus the therapeutic regimen was ready: 10 seconds "on" 50 seconds "off" for 10 pulse trains. After ready the protocol developed by Kots and Xvilon this should be put to the test: The authors selected two groups of volunteers and applied the scheme 10/50/10 daily group and every other day for another group and carried out the assessment of muscle torque after 9 and 19 days. The evaluation was made of the torque through the MVIC. The perimeter of the lower limb stimulated was also performed.

The authors concluded based on their observations that the current Russian produced an increase in muscle strength in the muscles excited compared to voluntary muscle contraction. Another important observation made by the authors was that all volunteers stimulated tolerated progressive intensities of stimulation in both the group and in 9 of 19 days of stimulation Russian. The increase of the circumference of the lower limb was observed also stimulated. For daily sessions for 9 days for 19 days or alternate, the authors observed no differences in the variables studied.

Possible mechanisms that lead to increased muscle strength due to the use of current Russian

Kots & Xvilon used a control group who performed MVIC, six times a day for 19 days. The authors observed no significant increases in muscle strength before and after the training period.

The same russian group as described in the above reference, reported the use of electrical currents in the kilohertz frequency range to increase muscle strength. The currents were used for training without an alternating and constant modulations and the other one-time AC modulated bursts at 50 Hz or 10 ms "on" and 10 ms "off". The authors noted the direct effects of stimulation, ie made in the abdomen where indirect and muscle stimulation was performed corresponding to the peripheral nerve that is aimed muscle training.

The muscles were stimulated for wrist and finger flexors and medial and lateral gastrocnemius. For the flexor muscles of the wrist and fingers, direct stimulation was performed by means of conventional electrodes that are already known and indirectly through percutaneous electrodes implanted below the elbow. The same sizes of electrodes were used for stimulation of the gastrocnemius, but details of the position are not mentioned in the manuscript. The study was divided into four distinct parts and for each part of the study volunteers ranged the number of 7-10.

For the first part of the study Adrianova et al. (1971) used the AC and without modulation frequencies of 100, 500, 1,000, 2,500, 3,000 and 5,000 Hz to stimulate the flexor muscles of wrist and fingers. The authors measured the frequency used for each motor threshold, the maximum tolerated current and voltage needed to elicit 60% of the torque induced electric.

The authors suggest that as it increases the frequency of current also increases the level of stimulation, but the discomfort brought about by the use of electrical stimulation decreases. The authors have measured quantitatively the discomfort and thus seems that these observations were empirical and not scientific.

However, at this literature already offers evidence that really proves the greatest comfort for patients with the use of medium frequency currents (Guirro et al. 2000).

Back in the manuscript Adrianova et al. (1971), the authors observed that for the direct stimulation of the gastrocnemius muscle the maximum force of 92.5kg or approximately 70% of maximal voluntary isometric contraction was achieved with 2.5Hz frequency current. As for indirect stimulation of the flexor muscles of wrist and finger maximum force used was 1 kHz. Above this frequency value of the fatigue appeared rapidly.

The second part of the study Adrianova et al. (1971), the objective measurement of muscle strength with different currents and frequencies used and described above. According to the authors, the indirect stimulation with a current of frequency equal to 1 kHz was more efficient in providing the increased muscle strength independently of the power (less modulated or modulated burst at 50Hz). As for direct stimulation, the alternating current of 2500Hz managed to promote a greater increase in muscle strength when compared to other frequencies tested. Interestingly the authors did not test the alternating current modulated in bursts, which is closest to the Russian proposal by the group.

In the third part of the study authors then decided to compare the frequencies of 1 kHz and 2500 kHz since the former was more effective in indirect stimulation and direct stimulation in the second. The results were repeated again as the second part of the study, but again the current modulated bursts was not used by the authors.

The authors also mention that the level of muscle force generated by the two frequencies (1 kHz and 2500 kHz) was very similar, which in theory suggests that direct stimulation of the muscle

may favor the recruitment of muscle fibers deep indeed discarded by most literature addressing the subject. The literature suggests that excitomotor be able to stimulate only the superficial fibers.

The modulation Bursts

Without presenting scientific basis consistent Adrianova et al. (1971) found that when the current of 2500 Hz is applied continuously or in 10 ms bursts and 50 Hz the maximum force achieved after stimulation is not affected. The study of Soloviev E.N. (1963) also supports the findings of Adrianova et al. (1971), which recommends a 50 Hz burst modulation according to this modulation

Providing the interruption of the current provided to the patient which could delay muscle fatigue of the patient during the training.

The recent study by Ward and Robertson (2002) supports the hypothesis raised by Adrianova et al. (1971) and Soloviev (1963). The authors evaluated the motor threshold at frequencies ranging from 1 to 25kHz and little difference was found between the stimuli offered continuously and modulated bursts.

In the fourth part of his study Adrianova et al. (1971) investigated the ability of modulation bursts at 50Hz to avoid a possible situation of muscle fatigue without reducing the torque generated electrically by the current.

The authors compared continuous or constant stimulation compared to stimulation in bursts modulated by direct stimulation of the gastrocnemius and indirect flexors of wrist and fingers. The observed results support the hypothesis that a modulation in bursts at 50Hz and the duty cycle of 50% does not reduce the torque generated electrically.

In the same study, Adrianova et al. (1971) indicated a gain in muscle strength in two different groups of volunteers. The first group received the current in the gastrocnemius muscles of the frequency of 2,500Hz once daily for 18 days. The maximal voluntary contraction the circumference of the limb and the height of jumps performed were measured.

Half of the second received electrical stimulation in the anterior tibial muscle 2,500Hz and the other half received the current in the muscle with the same frequency equal to 1,000Hz. For both stimulated groups, the scheme used was the same (10/50/10) modulation bursts at 50Hz and duty cycle of 50% applied to the maximum intensity tolerated by the volunteers.

The observed strength gains were greater for group 1 (45% increase). The gain in strength was accompanied by an increase in the circumference of the limb 3%, and an increase in height of the heels 15%.

It is important to note that not only were the studies by Kots and his group found to increase muscle strength after the use of current Russian, other groups are less interested in marketing than the name "Russian" features also point to the effectiveness of the remedy in various populations. A question pointed out by scientists from related fields would be compared with the control groups used by Kots and colleagues, but the results of other studies as mentioned alleviate this concern.

There is lot of literature on studies that show the evidence that the current Russian is more effective over the voluntary exercise in increasing strength of skeletal muscle. The converse is also true, ie, the voluntary exercise not appear to be more effective in relation to the current in increasing the strength of skeletal muscle. Thus, when possible, we suggest the combination of both features when the goal is muscle strengthening.

The use of a combination of voluntary exercise Russian plus the current due to the fact that different patterns of muscle recruitment achieved by two distinct features because it is known that exercise preferably volunteer recruit the slow twitch fibers (Type I) while stimulation Russian recruit in reverse, first the fast twitch muscle fibers (type II) which respond more effectively to the training of muscle strength and motor neurons that are innervated by large diameter.

It is important to note that the majority of experiments conducted by the Russians to verify the effectiveness of the chain in question was based on observation of the current application with Russian variation on the original parameters of the responses and subsequent observation of fatigue and muscle force generation after muscle training.

A second reason to avoid the use of isolated voluntary muscle contraction would be that this favors the risk of increasing the generating capacity of muscle strength, without, however, achieve great changes in the speed of muscle contraction, which would influence negatively and so directly the ability of skeletal muscle in generating muscle power.

It is known that in certain situations, the joint motion becomes unfeasible due to problems such as reduced muscle strength, swelling and limitation of joint movement itself and in these situations by electrical stimulation of the Russian power should be used alone.

The material developed by Kots & Xvilon physiological way justifies the use of the scheme 10/50/10 (Kots YM, Xvilon VA, 1971, Trenirovka mishechnoj sili metodom elektrostimuliastsii: soobschenie 2, trenirovka metodom elektricheskogo razdrazenii mishechi. Content. Pract. Fis. Cult., 4: 66-72.), as for the current Russian authors to cause an increase in muscle strength could not in any way lead to the occurrence of fatigue in skeletal muscle, because if that happened during training would be immediately reduced work capacity and muscular adaptations as a result of this training would be of small magnitude.

The observation of the authors about the decline in force using the pulsed current at 50 Hz single phase with different periods "on" and "off" for 10 minutes was evidence that the stimulus would not lead to muscle fatigue.

According to the authors, to a frequency of 50 Hz the dominant mechanism of muscle fatigue is related to the depletação of neurotransmitters as well as the failure of impulse propagation of depolarization by the muscular fibers more specifically by tubular "T". These findings are supported by recent literature: JONES DA, 1996, High and low-frequency fatigue revisited. Minutes. Physiol. Scand., 156:265 - 270. Thus, the time 10 minutes in training regimen appears to be important.

It is very important to emphasize that Kots & Xvilon (1971) did not use alternating current for the tests, but a monophasic pulse!. Thus, one can not ignore the fact that some authors disagree with this treatment regimen.

As the frequency of 2,500Hz stimulation used in Russian, this does not seem to be a consensus in the scientific literature. In experiments by Adrianova et al. (1971) have used only the indirect stimulation, ie the peripheral nerve at frequencies ranging from 100Hz to 5kHz. Ward and Robertson (1998) examined the frequency bands and 1 to 15 kHz, the frequency modulated bursts of 50Hz and found that the maximum torque found for the wrist extensors was at a frequency of 1kHz. Stimulation was performed by the authors directly and indirectly.

According Delitto (2002), the data in the literature regarding the frequency of 2500Hz modulated bursts at 50Hz stimulation used in Russian is the most suitable but this conclusion is based more on inference than on experimental measurements very well controlled. The author suggests that this hypothesis is tested experimentally for other therapeutic perspectives to be achieved.

Adrianova et al. (1971), studied two different types of electrical current being modulated in an alternating and pulsed bursts and another lower frequency and. The authors concluded that the stream of 2,500Hz to be used according to provide greater pleasantness of stimulation to the patient.

D'Arsonval A., (1981) after experiments suggest that the alternating current voltage with a fixed excitation neuromuscular could promote more intense in the frequencies from 1,250 to 1,500 Hz, making it more stable in the contraction frequency of 2,500Hz. Of 2,500Hz to 5,000Hz, the levels of muscle contraction decreased exponentially.

The author also suggests that patients undergoing the training reported greater pleasantness during the stimulation sessions when the applied current pulses had higher frequencies.

Thus, depending on the information described above can be concluded that:

- The studies presented in the material and Kots & Xvilon Adrianova, effectively support the use of current Russian.
- Adrianova et al. (1971) concluded that the frequency of 1 kHz to about 2.5kHz should preferably be used for higher power output when the muscles are stimulated in an indirect manner, peripheral nerve stimulation. This hypothesis to direct stimulation is supported in a recent study by Ward and Robertson (1998)
- The frequency 2.5 kHz should be used.
- The question of how much alternating current modulated to bursts of current Russian origin is more effective for the production of muscular strength in relation to low frequency pulsed current is still open pending further investigation.
- The regime 10/50/10 characteristic of Russian power was drawn from the use of a monophasic pulsed current of low frequency and not from an AC-modulated bursts and average frequency which holds Russian stimulation.
- The regime 10/50/10 was chosen for electrical stimulation through the current Russian as a function of not causing reduced muscle strength during 10 minutes of stimulation.
- The initial studies using the current Russian support the use of the resource, but more studies are necessary for some questions are elucidated completely.
-As regards the frequency of treatment per week does not seem suitable to take into account what has been proposed by Russian authors stimulation breeders since the need of the number of sessions varies from patient to patient depending on the condition being treated.

Electro stimulation - CARE AND CONTRAINDICATIONS

There is so far absolute contraindication to the use of electrical stimulation; however, some precautions should be taken:

It does not apply to Pain Diagnosed: can motivate a more vigorous physical activity before a lesion is recovered or mask serious illness.
Implanted electronic device: it is recommended that a patient with an implanted electronic device (eg a pacemaker) is not subject to stimulation unless a specialized medical opinion has been previously obtained.
Cardiac patients: may have adverse reactions. Be very careful attention and refold during application of electrical stimulation.
DISRRITIMIAS: Monitor patients with ECG during the first sessions.

Pregnancy: Avoid application during the first three months, especially in the lumbar and abdominal.

Not Stimulate About the carotid sinus: may exacerbate vago-vagal reflexes.
Reduced Intensity With Stimulating Regions of the Neck and Mouth: to prevent spasms of laryngeal and pharyngeal muscles.

Care applications in children and senile and epileptic patients.
Monitoring equipment: Avoid using electrical stimulation in the recovery room after surgery when the patient is being monitored by cardiac monitor or any other type of electronic monitoring.
Skin conditions: Continued use of electrical stimulation can cause dangerous irritation of the skin. If rash or other symptoms often appear, power down, remove the electrodes and notify your doctor or physiotherapist.
Do not place the electrodes on the mouth or neck: muscle spasms can occur and cause blockage of airway.
Aversion to the use of electrical stimulation: Some people find extremely unpleasant electrical stimulation. These patients probably should be excluded from treatment.

Placement of Electrodes

The key to success in the use of electrical stimulation is in the correct placement of the electrodes. Sometimes it is necessary to try several places before determining the best placement and bloquearmos pain.

Before placing the electrodes, wipe the area with mild soap and water, thus removing the grease and possible fragments of the skin, thus reducing the resistance to electrical current. Rinse and dry the area before placing the electrodes.

Apply appropriate conductive gel, provided by the manufacturer, homogeneous layer of about 1-2 mm thick at the bottom of each electrode. Some are self-adhesive electrodes and do not require gel.

The electrodes must be placed with adhesive tape (except self-adhesive). Make sure that all sides are tight and adjusted to the skin.

After the time of application, remove the pads, wash the skin and the electrodes with water and soap, rinse and dry.

General factors that interfere with the stimulation:

* Obesity
* Presence of peripheral neuroplastia
* Decreased sensory
* Acceptance and tolerance of current stimulating the patient

*In obese: the thickness of the fat isolates the motor nerve.

In patients with peripheral neuroplastia: there is no response to electrical stimuli of short duration.

In sensory disability: There may be irritation of the skin.

The patient, should gradually get used to the sensation produced by stimulation.

The THERAPIST: You must master the techniques of stimulation.

ELECTRODES - RECOMMENDATIONS

The NEURODYN 10 channels allows for a transcutaneous neuromuscular stimulation through special electrodes that are provided with the equipment.

The size (area in cm^2) of the electrodes used in electrostimulation is very important;

- We recommend to only using the electrodes that are provided as accessories of the NEURODYN 10 channels. The application method of these electrodes is very simple. Generally, the used electrodes are perfectly accommodated on several parts of the body, causing a deep effect on tissues and a comfortable treatment for the patient.
- If the user would like another type of electrode, we always recommend those of a size larger than the ones supplied as accessory.
- Electrodes with a size smaller than those supplied as accessory can cause skin irritations and burns. If the use of these smaller electrodes is necessary, we recommend the current density does not exceed 2 mA effective/cm^2. If these values should be exceeded, the user should be careful as related to possible hazardous effects (NBR IEC 60601-2-10).
- The maximum values of the output current for the patient, provided by this equipment do not exceed the current density limit specified by the standard NBR IEC 60601-2-10. Thus, if it is necessary, the equipment can be operated in the maximum output mode with the recommended electrodes.
- Some chemical products (gel, lotion, etc) can damage electrodes, decreasing their lifetime. Always use the gel provided as accessory.
- After using the electrodes clean them with running water. Always clean the electrodes before storing them.

Attention: The application of the electrodes close to the thorax may increase the risk of cardiac fibrillation.

ELECTRODES – BIOCOMPATIBILITY (ISO 10993-1): IBRAMED declares that the silicone rubber electrodes provided with the equipment do not cause allergic reactions. These electrodes should be only put in contact with the intact surface of the skin by respecting a limit of time of 24 hours for such a contact.

There are no risks of harmful effects to the cells, nor is there any allergic reaction or of sensitivity. The electrodes do not provoke a potential irritation of the skin.

Self-adhesive Electrodes (disposable): The Neurodyn 10 channels can be used with self-adherent electrodes, however, IBRAMED shall not be held responsible for their usage. IBRAMED recommends that the cares described in page 65 be followed (Electrodes - recommendations), mainly as related to the current density and size. If a self-adherent electrode is to be used, we suggest to follow the instructions of the manufacturer selected by the user.

Durability of silicon rubber electrodes:

The wear due to usage time of the silicon electrodes is normal.
A worn electrode will lose the homogeneity of the conduction to electric current giving the feeling that the apparatus is weak. Formation of electric conduction points can occur, where the current density will be very high, which may cause a uncomfortable feeling to the patient. Replace the silicon electrodes at maximum every six months, even if unused or on a monthly basis in case of intense usage. Should any cracks be present, the electrode should be replaced immediately.

Environmental Protection: IBRAMED declares that there are no risks or special techniques associated with the elimination of this equipment and accessories at the end of their useful lives.

ELECTROLIPOLISE

INFORMATION ON NEEDLE

General care:

BIOSECURITY – It can be defined as: “The set of actions covering the prevention, minimization or elimination of risks inherent to the survey activities, production, learning, technologic development and service rendering, risks that may jeopardize the human, animal health and the environment or quality of developed works"

The major causes of accidents are related to:

- Unsuitable instruction
- Inefficient supervision
- Improper use of Individual Protection Equipments (EPI)
- No following of existent rules.
- Improper practices.

- Defective planning.
- Excessive day's work.

For good practices of service to patients, it is necessary to know some rules and the safety procedures in order to minimize the risks of accidents.

Needle specification:

There are several manufacturers of acupuncture needle that are used in Electrolipolysis. IBRAMED suggests the use of acupuncture needles of 50 mm size. They should be manufactured in stainless steel and should not bear any plastic parts. The needle is reusable. It should be used always on the same patient and immersed in sterilizing liquid after its use in order to avoid contamination.

ATTENTION: The user should purchase only acupuncture needles that are **registered at ANVISA**.

Rejection of the needle:

GROUP – BLUNT FORCE PUNCTURE – they are the objects and tools that have corners, borders, points or rigid and sharp protuberances, able to cut and perforate a body.

They can be joined in this group: blades to shave, scalpels, **needles**, dissecting knives, flasks in glass, blades and other similar objects derived from health centers.

Needles should be thrown away separately immediately after their use. They should be kept into rigid covered recipients resistant to puncture, rupture, and leakages.

Reminders:

CARES TO BE OBSERVED DURING THE INSETION OF NEEDLES

- Keep the material to be used in a sterile place;
- The needle extremity should be kept sterile before its penetration;
- After the cleaning (chlorhexidine 0.2%) of the patients' skin, do not touch the insert point.
- The needles should be kept in their original packing and kept in a proper place where there is no risk of contamination.

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ANNEX – Map of Motor Points

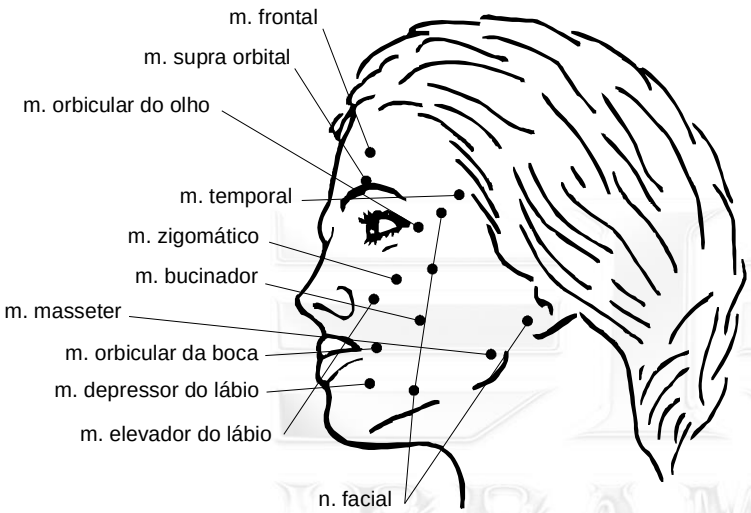

Figure 1 – Motor Points in the Face

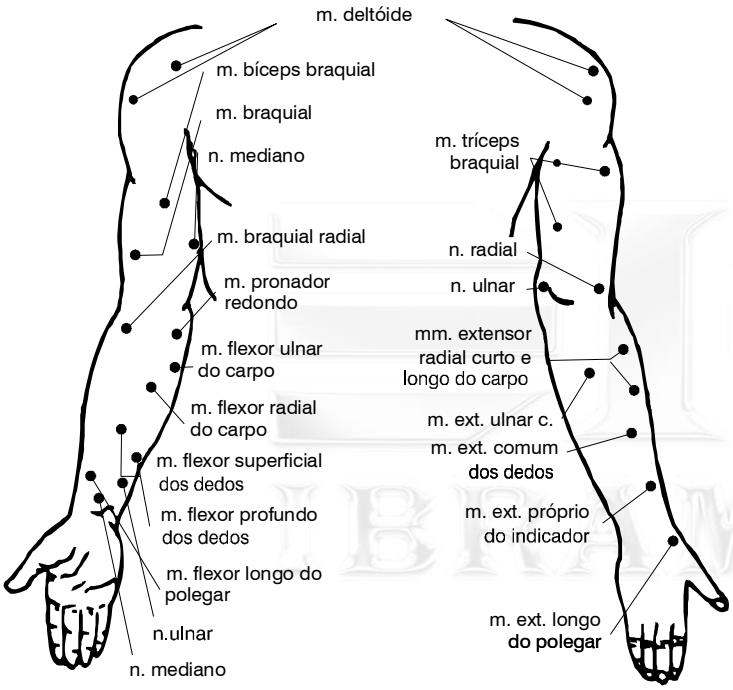

Figure 2 – Higher Limb Motor Points

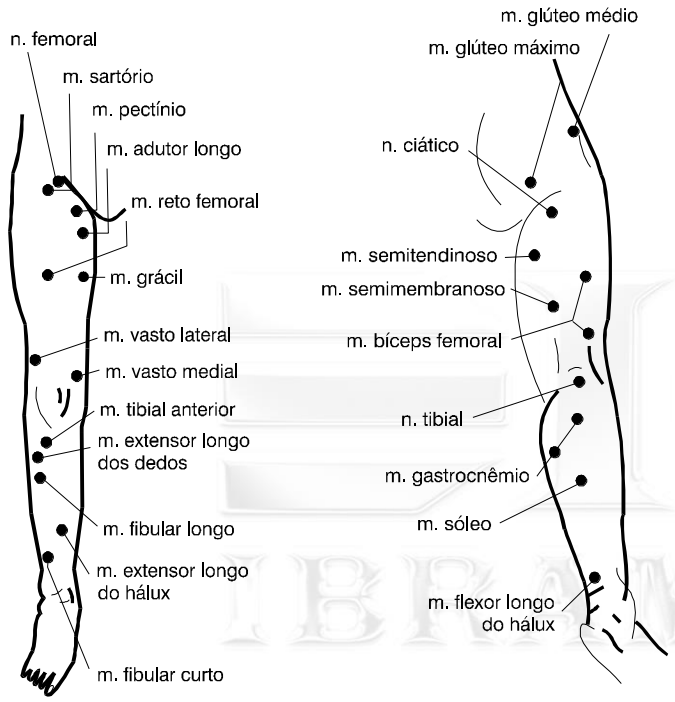

Figure 3 – Lower Limb Motor Points

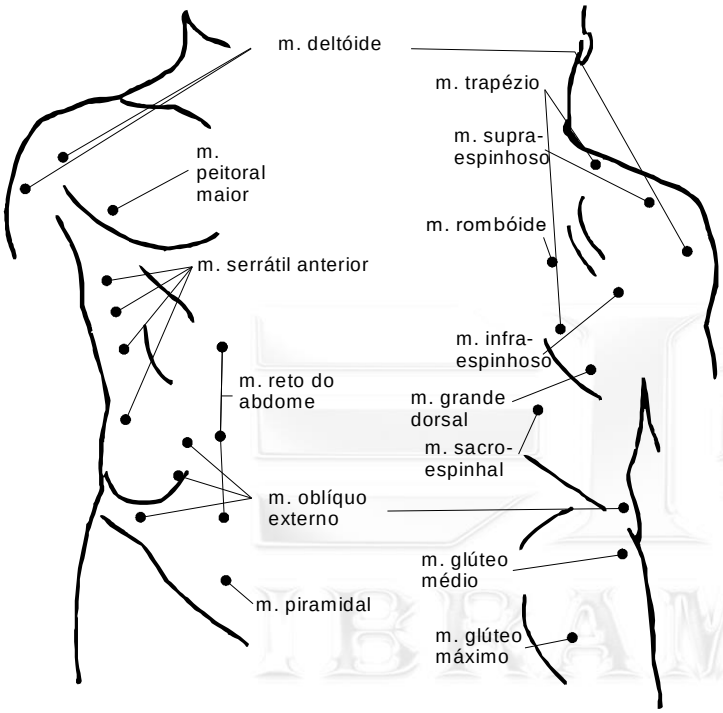

Figure 4 – Motor Points in the Torso

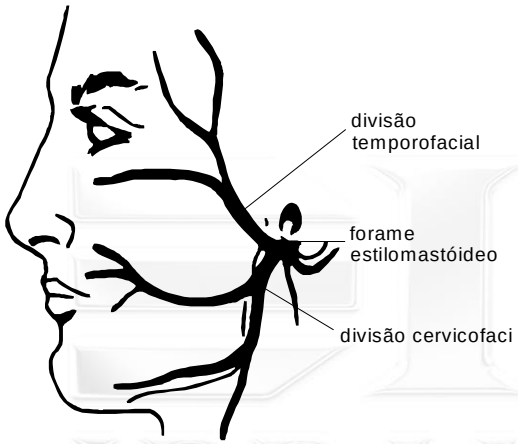

Figure 6 – Distribution of Facial Nerves

ELECTRODES CLEASING

After using the electrodes clean them with running water. Always clean the electrodes before storing them.

MAINTENANCE

We suggest that the user inspects the equipment and performs preventive maintenance at IBRAMED or at the sales point **each 12 months** the equipment is used. As manufacturers, IBRAMED is deemed responsible for technical or safety characteristics of the product **only in cases** when the unit has been used in accordance with the instructions contained in the user's manual, and where maintenance, repairs or modifications have been made by the manufacturer or by expressly authorized agents, and where the components which can cause safety risks and also where components for the proper functioning of the equipment have been substituted, in case of repairs, with original substitution parts.

If required, IBRAMED will be able to make available the technical information necessary for eventual repairs of the equipment (circuit schemes, list of parts and components, etc.). However, this does not imply a repair authorization. We do not assume any responsibility for repairing performed without our express written authorization.

WARRANTY

IBRAMED, Indústria Brasileira de Equipamentos Médicos LTDA, herein identified to the consumer at the address and telephone number: Rua Milão, 50; telephone number +55 (19) 38179633, guarantees this product for the period of eighteen (18) months, observed the conditions of the warranty terms attached to the documentation of this equipment.

TECHNICAL ASSISTANCE

If you have any doubts or problems related to the operation of your equipment, please, contact our technical department. Call: **55 19 3817.9633**

TROUBLESHOOTING

What might seem to be a problem at first sight, may not always be a malfunctioning. Therefore, before contacting the technical assistance, check the items described on the table bellow.

Problems	**Solution**
The equipment does not turn on 1	• Is the power cable properly connected? If it is not, connect it. Also check the power outlet on the wall.
The equipment does not turn on 2	• Have you checked the protection fuse? Check if they are properly connected. Check also if the value is in accordance with the indicated in the operation's manual.
The equipment is on but does not emit current to the patient 1.	• Have you followed the recommendations and instructions in the operation manual correctly? Check and go through the steps described in the chapter about controls, indicators e operation.
The equipment is on but does not emit current to the patient 2.	• Have you checked the electrodes and the connection cables? Check if the cable plug is properly connected to the equipment. Check if the electrodes are correctly placed to the patient body.
The equipment does not turn on and/or is not working properly.	• Check if the quantity of gel used is sufficient. • Check if the electrodes are not outworn.

Warranty Term

1) Your IBRAMED product is certified against manufacture defects, if considered the established conditions in this manual for 18 following months.

2) The period of warranty will count from the first purchase date by the consumer, even when the product is transferred to a third party. The replacement of parts and the cost in repairs of malfunctions originated from manufacturing will be comprehended in the warranty.

3) The warranty procedures will be exclusively made by IBRAMED sales points, by IBRAMED itself or by other parties specifically designated by IBRAMED.

4) WARRANTY DOES NOT COMPREHEND DAMAGES WHICH COULD OCCUR TO THE EQUIPMENT IN CASE:

The equipment is not used exclusively for medical purposes.

The specifications and recommendations in the user's manual are not observed in the installation and use of the equipment.

Accidents or natural hazards, connection to electrical system with inappropriate voltage, and/or excessive fluctuation or overcharge/ overvoltage occur.

The equipment is not handled properly, is not taken proper care of, or suffers alterations or repairs made by not certified people or companies not accredited by IBRAMED.

There is removal or adulteration of serial number of the equipment.

Any accident in transportation occurs.

5) Legal warranty does not cover: expenses with installation of product, installation of software, installation of microcomputer, transport of product to the factory or sales point, labor cost, materials, parts and adaptations necessary to the preparation of the premises where the equipment will be used, such as: electric wiring, computer technician expertise, masonry, hydraulic installations, grounding system, as well as its adaptations. The warranty does not cover either parts subjected to wear and tear such as: command switches, control keys, handles and mobile parts, sucker applicators, application pens for microderm abrasion, power cable, connection cables to the patient, transducer cables, conductive silicon rubber applicators, diathermy applicators, batteries, ultra-sonic transducer (when improper use or its fall is proved), equipment cabinet.

6) No sales point has authorization to alter the conditions here mentioned, or to take any commitment in the name of IBRAMED.

Aparelho:

Número de série:

Registro ANVISA (M.S.):

Data de fabricação:

Prazo de validade : 5 anos

Engenheiro responsável : Maicon Stringhetta

CREA - 5062850975

NEURODYN 10 channels – Accessories

The accessories, electrodes or cables are used with the equipment in accordance with the requirements for electromagnetic compatibility emission and immunity.

The use of accessories, cables and electrodes than those for which the equipment is designed can significantly degrade the performance of emissions and immunity.

List of accessories, electrodes, cables and their lengths, with equipment designed Neurodyn 10 channels to meet the requirements for electromagnetic compatibility:

1) 01 detachable power cable
2) 05 cables (each with two wires and pins at the ends) connection to the patient (channel 1 - orange, channel 2 - black, channel 3 - blue, channel 4 - green, channel 5 - gray, channel 6 - pink channel 7 - white, channel 8 - yellow, channel 9 - brown, purple channel 10) - K-652 codes, K-653 K-654, K-655 and K656 (length 1.5 meters each).
3) 01 cable (with two wires and electrodes pen facial w / current RUSSIAN / AUSSIE) connection to the patient - Codes K-662 (length 1.5 meters each).

List of other accessories that do not affect the requirements for electromagnetic compatibility:

4) 10 red alligator clip connectors - Code G067 and 10 black alligator clip connectors - Code G066
5) 05 pairs of electrodes PAD green silicone rubber 75mm - code P-205
6) 05 pairs of electrodes PAD blue silicone rubber 75mm - code P-206
7) 01 pair of conductive electrodes face 3 x 9 x 5 x 10 - E-100 Code
8) 01 pair of conductive electrodes facial 3 x 9 x 5 x 15 - Code E-099
9) 10 elastic bands with velcro - Code C-040
10) 01 CD manual of instructions
11) - 01 outstanding protection fuse 5A - Code F-019
12) 01 tube gel (100g) ANVISA registration No. 80122200001 (RMC manufacturer Gel Clinical) - Code B-013
13) 10 packages with 10 each for acupuncture needles 0.25 mm x 50 mm - Code A-224 (ANVISA registration No. 80434060002)

The use of accessories, cables and electrodes than those for which the equipment is designed can significantly degrade the performance of emissions and immunity. Therefore, DO NOT USE accessories, cables and electrodes equipment Neurodyn 10 channels in other electro medical equipment or systems. The accessories, electrodes and cables described in this operating manual are designed and manufactured by IBRAMED for use only with equipment Neurodyn 10 channels.

Remember:

The use of cables and other accessories other than those specified on this page may result in increased emissions or decreased immunity of the equipment Neurodyn 10 channels.

NEURODYN 10 channels – Technical Characteristics

The NEURODYN 10 channels is a equipment designed for continuous operation mode. It uses microcontrollers which guarantees the precision of the values displayed. This exactitude of the operation data is in accordance with what is prescribed by the particular standard for the safety of neuromuscular stimulation equipment – NBR IEC 60601-2-10, clause 50 / sub-clauses 50.1 and 50.2. The output amplitude control continuously controls the current intensity from the minimum to the maximum and its minimum value does not exceed 2% of the value in the maximum position. The parameters, such as, format of output wave, pulse duration, pulse repetition frequency, out current amplitude range do not differ more than 30% mentioned in the technical description below.

The values covering the pulse duration and pulse repetition frequencies herein described were measured at 50% of the output maximum amplitude.

These parameters are valid for a charge impedance of 1000 ohms. The effect of the charge impedance in the described parameters is very important. If the apparatus is operated outside of the specified charge impedance, an inaccuracy in the values of the parameters may arise as well as a change in the wave format herein described.

Neurodyn 10 channels is a CLASS II monophasic equipment with BF applied part for safety and protection.

AC Input - Network voltage in the range of 100 - 240 V (50/60 Hz)

Input power - Consume (max.):.....100 VA
CLASS II EQUIPMENT with BF applied part of safety and protection.

Output channels----------10 independent channels in amplitude:
Channels 1 to 10 are designed for C.RUSSIAN, C Aussie and Electrolipolysis techniques

Amplitude Range (mA peak to peak):

Russian----------0 to 140 mA
Aussie ----------0 to 140 mA
Electrolipolysis ----------0 to 20 mA

Pulse format ----------sine (depolarized)

Frequency of pulse repetition (R):
RUSSIAN----------carrying 2500 Hz modulated by a low frequency with a possibility of selecting from 1 to 120 Hz.
AUSSIE ----------carrying 1,000 Hz or 4.000 Hz modulated by a low frequency (Bursts of 4 ms or 2 ms) with a possibility of selecting from 1 to 120 Hz.
ELETROLIPOLISE---------- carrying de 2.500 Hz modulated by 5 Hz low frequency

Duration (Wodth – T) of a unique current Pulse RUSSIAN at 50% of the maximum amplitude----------400us

Duration (width – T) of a unique current Pulse AUSSIE of 4.000 Hz at 50% of the maximum amplitude----------250us

Duration (width – T) of a unique current Pulse AUSSIE of 1,000 Hz at 50% of the maximum amplitude----------100us

ON Time:----------variable from 1 to 60 seconds

OFF Time:----------variable from 1 to 60 seconds

RISE (increase time of the Pulse Train)----------variable from 1 to 20 s

DECAY (decrease time of the Pulse Train)-----variable from 1 to 20 s
Timer:……variable from 1 to 60 minutes

Dimensions (approx. in mm)----------360 x 320 x 120 (W x D x H)
Weight (approx. without accessories):……2.6 Kg
105

Maximum stacking :……5 boxes

Temperature for transport:……5 to 50ºC

Room Temperature for work:……5 to 45ºC

mA = milliamperes **Hz** = Hertz **us** = microseconds **ms** = milliseconds **VA** = volt amperes **aprox.** = approximate **mm** = millimeter

Note: The equipment and its characteristics are subject to change without previous notice.

Electromagnetic Compatibility:

The Neurodyn 10 channels were designed to comply with the requirements determined by norm IEC 60601-1-2 of electromagnetic compatibility. The objective of this norm is:

- to guarantee that the level of the spurious signals generated by the equipment and irradiated to the environment are below the limits specified in the norm IEC CISPR 11, group 1, class A (radiated emission).
- to guarantee the immunity of the equipment to electrostatic discharges, by either contact or air, stemming from the accumulation of electrical static discharges acquired by the body (Electrostatic Discharge - IEC 61000-4-2).
- to guarantee the immunity of the equipment when submitted to an electromagnetic field incising from external (Immunity to Irradiated RF - IEC 61000-4-3).

Precautions:

- The operation at a short distance (1 meter, for example) of a short wave or microwave equipment can produce instability in the output of the equipment.
- In order to prevent electromagnetic interference; we suggest you to use an electric network line for NEURODYN 10 channels and a separate group for short wave or microwave equipment. We also suggest that the patient, o NEURODYN 10 channels and the connection cables are placed at least at a distance of 3 meters away from the shortwave or microwave therapy equipment
- Radiofrequency communication equipment, mobile phones may cause interference and affect the performance of Neurodyn 10 channels. Always install this equipment according to what is described in this instruction manual.

Attention:

NEURODYN 10 channels complies with all the technical norms of electromagnetic compatibility if the cables, electrodes and other accessories supplied by IBRAMED and described in this manual are used. (chapter: Accessories and technical characteristics).

The use of cables, electrodes and other accessories from other manufacturers and/or different from those specified in this manual are used, as well as the substitution of internal components of o NEURODYN 10 channels , this can result in increase of emissions or decrease in the equipment immunity

- NEURODYN 10 channels must not be used adjacently or stacked on top of other pieces of equipment.

Directions and Manufacturer's Statement – electromagnetic emissions		
Neurodyn 10 channels electro-stimulator is destined for use in the electromagnetic environment specified below. The user of the equipment must ensure that it is used in such an environment.		
Emission Essay	**Compliance**	**Electromagnetic Environment - directions**
RF Emissions NBR IEC CISPR 11 IEC CISPR 11	Group 1	Neurodyn 10 channels electro-stimulator uses RF energy only for its internal functions. However, its RF emissions are very low and unlikely to cause any interference in nearby electronic equipment
RF Emissions NBR IEC CISPR 11 IEC CISPR 11	Class A	Neurodyn 10 channels electro-stimulator is adequate for use in all premises which are not residential and not directly connected to the public low tension electric power distribution line which supplies buildings appropriate for domestic use
Harmonics Emission IEC 61000-3-2	Class A	
Emissions due to tension fluctuation/scintillation IEC 61000-3-3	Class A	

Directions and Manufacturer's Statement - electromagnetic immunity			
Neurodyn 10 channels electro-stimulator is destined for use in the electromagnetic environment specified below. The user of the equipment must ensure that it is used in such an environment.			
Immunity Essay	**Level of Essay IEC 60601**	**Level of Conformity**	**Electromagnetic Environment - directions**
Electrostatic Discharge (ESD) IEC 61000-4-2	± 6 kV per contact ± 8 kV by air	± 6 kV per contact ± 8 kV by air	The flooring must be either wooden, concrete or ceramic. If the flooring is covered with synthetic material, the humidity must be of least 30%.
Rapid electric transitory / train pulse (Burst) IEC 61000-4-4	± 2 kV in the Power lines ± 1 kV in the input /output lines	± 2 kV in the Power lines ± 1 kV in the input /output lines	The quality of the power supply should be equivalent to the one of a hospital or a typically commercial establishment.
Surges IEC 61000-4-5	± 1 kV differential mode ± 2 kV regular mode	± 1 kV differential mode ± 2 kV regular mode	The quality of the power supply should be equivalent to the one of a hospital or a typically commercial establishment.

Immunity Essay	**Level of Essay IEC 60601**	**Level of Conformity**	**Electromagnetic Environment - directions**
Tension falls, short interruptions and tension variations in the input power lines IEC 61000-4-11	< 5% U_T (> 95% of tension fall in U_T) per 0.5 cycle 40% U_T (60% of tension fall in U_T) per 5 cycles 70% U_T (30% of tension fall in U_T) per 25 cycles < 5% U_T (> 95% of tension fall in U_T) per 5 seconds	< 5% U_T (> 95% of tension fall in U_T) per 0.5 cycle 40% U_T (60% of tension fall in U_T) per 5 cycles 70% U_T (30% of tension fall in U_T) per 25 cycles < 5% U_T (> 95% of tension fall in U_T) per 5 seconds	The quality of the power supply should be equivalent to the one of a hospital or a typically commercial establishment. If the user of the equipment requires continuous operation during energy interruption, it is recommended that the equipment should be fed by a source of uninterrupted power supply or a battery.
Magnetic Field in the frequency of Power feed (50/60 Hz) IEC 61000-4-8	3 A/m	3 A/m	Magnetic fields in the frequency of power supply must be on the same levels characteristic of a hospital environment or a typically commercial establishment.
NOTE: U_T is the c.a. power feed tension before the application of the essay level.			

<table>
<tr><td colspan="4">Directions and Manufacturer’s Statement - electromagnetic immunity</td></tr>
<tr><td colspan="4">Neurodyn 10 channels electro-stimulator is destined for use in the electromagnetic environment specified below. The user of the equipment must ensure that it is used in such an environment.</td></tr>
<tr><td>Immunity Essay</td><td>Level of Essay
IEC 60601</td><td>Level
of Conformity</td><td>Electromagnetic Environment - directions</td></tr>
<tr><td>RF Conducted
IEC 61000-4-6</td><td>3 Vrms
150 kHz to 80 MHz</td><td>3 V</td><td rowspan="2">RF Communication equipment, portable or mobile, must not be used next to any part of Neurodyn 10 channels, including cables, with a separation distance of less than the recommended, calculated from the equation applicable to the frequency of the transmitter.

Separation distance recommended

d = 1.2 $\sqrt{P}$

d = 0.35 $\sqrt{P}$ 80 MHz up to 800 MHz

d = 0.7 $\sqrt{P}$ 800 MHz up to 2.5 GHz

Where P is the maximum output nominal potency of the transmitter in watts (W) according to the manufacturer of the equipment, and d is the separation distance recommended in meters (m).
It is also recommended that the Field intensity established by the RF transmitter, as determined by an electromagnetic inspection at the site should be lower than the conformity in each frequency band.
Interference around the equipment marked with the following symbol might occur: </td></tr>
<tr><td>RF Radiated
IEC 61000-4-3</td><td>10 V/m
80 MHz to 2.5 GHz</td><td>10 V/m</td></tr>
<tr><td colspan="4">NOTE 1: In 80 MHz and 800 MHz highest frequency band is applied.
NOTE 2: These directions may not be applicable in all situations. The electromagnetic propagation is affected by the absorption and reflection of structures, objects and people.</td></tr>
<tr><td colspan="4">[a] The Field intensities established by the fixed transmitters, such as base radio stations, telephone (cellular/wireless) and mobile terrestrial radios, radio amateur, transmission radio AM and FM and TV transmission cannot be theoretically predicted with accuracy. To evaluate the electromagnetic environment due to fixed RF, an electromagnetic, it is recommended to check the local. If the field intensity measurement at the local where Neurodyn esthetic is used, exceeds the level of conformity used above, the equipment must be observed in order to verify whether the operation is normal. IF an abnormal performance is observed, additional procedures may be necessary, such as reorientation or the reinstalling of the equipment.

[b] Above 150 KHz to 80 MHz frequency band, the field intensity should be lower than 10 V/m.</td></tr>
</table>

Recommended Separation Distances between portable and mobile RF and Neurodyn 10 channels

The Neurodyn 10 channels electro-stimulator is conceived to be used in electromagnetic environments in which RF disturbances are controlled. The user may help to prevent electromagnetic interferences by keeping a minimum distance between the portable and mobile RF communication equipment (transmitters) and Neurodyn 10 channels, as recommended below, according to the maximum potency of the communication equipment.

Maximum Nominal Output potency of the transmitter W	**Distance of Separation in accordance with the frequency of the transmitter m**		
	150 KHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 0.35\sqrt{P}$	800 MHz to 2.5 GHz $d = 0.7\sqrt{P}$
0.01	0.12	0.035	0.07
0.1	0.38	0.11	0.22
1	1.2	0.35	0.7
10	3.8	1.1	2.2
100	12	3.5	7

For transmitters with a maximum nominal output potency not listed above, the separation distance recommended in meters (m) may be determined by an equation applicable to the frequency of the transmitter, where P is the maximum nominal output potency in watts (W) according to the manufacturer of the transmitter.

NOTE 1: From 80 MHz to 800 MHz, the distance of separation relative to the highest frequency band is applied.

NOTE 2: These directions may not be applicable in all situations. The electromagnetic propagation is affected by the absorption and reflection of structures, objects and people.

FREE TECHNICAL ASSISTANCE CONTRACT

DETACH AND SEND THIS PAGE TO IBRAMED

In order to better serve you in future, please answer the following questions:

1- Your choice of this IBRAMED product was based on:

( ) newspaper or specialized magazines

( ) sales representative advice

( ) friend's advice

( ) exhibitor or showroom

( ) manufacturer's image

( ) technical assistance

2- Have you already owned similar equipment before?

( ) yes, IBRAMED ( ) yes, other brands ( ) no

3- In your opinion, what is considered as being more important in an equipment:

( ) aspect / appearance

( ) resources – versatility, assistance, technology, etc.

( ) price

4- How old are you?

( ) under 25 years old ( ) from 25 to 40 years old ( ) over 40 years old

5- Compared to your monthly wages, would you say the price of the equipment is:

( ) inexpensive ( ) reasonable ( ) expensive ( ) exaggerating

6- Which was the payment modality?

( ) cash ( ) installment

7- Please, make any comments here, either positive or negative, which you find relevant:

.....
.....
.....

Name :----------**DOB** ----/----/---

Address:----------

District :---------- **City**:----------**State**:----------

ZIP Code:----------**Tel.**:---------- **Equipment**:---------- **Serial Number:**----------